



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

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June 3, 2004

Gerard Thibeault
Executive Officer
Santa Ana Regional Water Quality Control Board
3737 Main St., #500
Riverside, CA 92501

Dear Mr. Thibeault,

We wish to offer our support for adoption of the Lake Elsinore/Canyon Lake nutrients TMDLs and proposed Basin Plan amendment and provide some comments for your consideration. We urge the Regional Board to promptly adopt these TMDLs, consistent with the State's commitment in the State-EPA Performance Partnership Agreement to submit final TMDLs for these waters for EPA approval by 2005.

We have been working with Santa Ana RWQCB for several years on these TMDLs for Lake Elsinore and Canyon Lake. We have reviewed and commented throughout the TMDL development and implementation planning process.

The historical record demonstrates these waterbodies have been impaired since the early 20th century. The primary cause of observed fish kills is due to low dissolved oxygen, which corresponds with high algal productivity due to excessive levels of nutrients. The resultant decay of fish and algae also produce offensive odors, an unsightly lakeshore and thereby adversely affect beneficial uses of these two lakes. We hope the Santa Ana Regional Board will take action to begin to restore the water quality in Lake Elsinore and Canyon Lake and meet all designated beneficial uses. Indeed, the Regional Board has the legal obligation, pursuant to the Clean Water Act and federal regulations (40 CFR 130.7(c)), to establish TMDLs for 303(d) listed waters.

The TMDLs and Basin Plan amendment define interim and final numeric targets which are consistent with the existing applicable water quality objectives for Lake Elsinore and Canyon Lake. Our review of the proposed TMDLs indicates that they meet all federal regulatory requirements and will be approvable upon submittal to EPA.

We understand some stakeholders have suggested the use of concentration-based nutrient TMDL allocations. Federal regulations allow TMDLs to be expressed in terms of mass per time, toxicity, or other appropriate measures; nonetheless, we strongly support the Regional Board's proposal to define the TMDLs and allocations in terms of annual mass loads. This approach is technically appropriate given the long nutrient residence times in lakes and reservoirs and the fact that nutrient loads vary substantially

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from year-to-year due to variability in water inputs to each lake. In other words, the desired water quality conditions are unlikely to be achieved using concentration-based allocations alone because they would permit massive nutrient loading into the lake sediments during moderate and wet years, which would then cause eutrophic and impaired conditions in moderate and dry years.

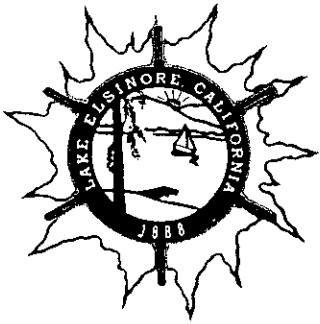
The Regional Board has developed flexible TMDLs using the best available information to date. The Basin Plan amendment outlines short- and long-term plans to address monitoring needs and improved hydrologic modeling. We recommend that pH monitoring of lake water column be included to elucidate ammonia concentrations relative to the water quality objective. The implementation plan also includes compliance schedules that are reasonable and provide adequate time for meeting the interim and final targets.

In closing, we commend the staff for developing a reasonable TMDL plan that is consistent with federal requirements and likely to result in timely attainment of water quality objectives in these water bodies. It is vital for the Regional Board to adopt this amendment without delay and proceed to begin implementing measures to attain water quality standards. If you have any questions concerning these comments, please contact Peter Kozelka, TMDL liaison to Santa Ana RWQCB, at (415) 972-3448.

Sincerely,



David Smith,
TMDL Team Leader



City of Lake Elsinore

"One City's Got More"

May 24, 2004

Thomas Buckley
Mayor

Genie Kelley
Mayor Pro Tem

VIA MAIL AND FACSIMILE (909) 781-6288

Daryl Hickman
Councilman

Hope Smythe, Senior Environmental Scientist
Santa Ana Regional Water Quality Control Board
3737 Main Street, Suite-500
Riverside, CA 92501-3348

Robert E. Magee
Councilman

Robert Schiffner
Councilman

Re: Basin Plan Amendment to Incorporate Nutrient TMDL for Lake Elsinore

Richard Watenpaugh
City Manager

Dear Ms. Smythe:

Thank you for this opportunity to comment on an issue that is critical to the City of Lake Elsinore. Lake Elsinore is the largest natural freshwater lake in Southern California and is the namesake of our City. The quality of life for the citizens of Lake Elsinore is fundamentally dependent upon the quality and quantity of water in the Lake. Currently, Lake Elsinore does not meet the basic "fishable and swimmable" goals of the Federal Clean Water Act.

All natural lakes are a product of their watershed. Lake Elsinore's Watershed encompasses a diverse patchwork of frequently competing interests and the San Jacinto River flowing through the region is the thread that binds together our shared economic, recreational, public health and wildlife concerns. Nutrients dissolve in rainwater and are transported to Lake Elsinore via the San Jacinto River. The City of Lake Elsinore's jurisdiction covers less than five (5%) percent of the 760-square mile watershed, therefore we have limited authority to control the nutrient sources upstream that continue to pollute Lake Elsinore.

All the people who live, work and play in this watershed contribute to the immense and widespread nutrient pollution problem. Fairness compels all those who contribute to the problem to be part of the solution. Lake Elsinore will never be Lake Tahoe, but reasonably strict controls must be set in motion to prevent nuisance conditions and protect the many beneficial uses of the Lake. It is our hope that the SARWQCB will

Hope Smythe, Senior Environmental Scientist
May 24, 2004
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remain engaged in this long-term challenge through adoption of this
Phased Nutrient TMDL Program and steadfastly commit to the
rehabilitation of Lake Elsinore.

Sincerely,

A handwritten signature in black ink, appearing to read "Dick Watenpaugh", with a stylized flourish extending from the end.

Dick Watenpaugh
City Manager

Cc: Mayor and City Council
Assistant City Manager
Director of Lake & Aquatic Resources

June 3, 2004

Re: Basin Plan Amendment to Incorporate Nutrient TMDL for Lake Elsinore

Comments by:

Pat Kilroy, Director
Lake & Aquatic Resources Department
City of Lake Elsinore

Overview:

The modeling for the Nutrient Source Assessment succeeded in consolidating all the known hydrologic, land use and water quality data within the San Jacinto River Watershed in a remarkable attempt to simulate the transport of nutrients to Canyon Lake and Lake Elsinore. However, this monumental effort was greatly hampered by the relevance of the historic data and by the nature of collecting water quality data in an arid watershed. Although the water quality record was incomplete and in some cases required practical assumptions, future monitoring and input into the evolving model will improve accuracy and should provide a valuable tool to help reduce nutrient pollution to the lakes.

For this Nutrient TMDL to succeed in a reasonable timeframe (15-years) it will require substantive changes in the production, protection and application of nutrients in the watershed. The Nutrient Source Assessment focused on the export of nutrients from multiple land uses, but failed to quantify the major sources of nutrients to the watershed itself. It is widely recognized by the scientific community that the best way to reduce non-point pollution is at the source. Reducing waste nutrient addition to the watershed itself, including dry years, will ultimately reduce the mass of nutrients transported to the lakes.

Conventionally phased TMDL Programs are based on adaptive management, where annual water quality monitoring allows timely adjustments to Wasteload Allocations (WLA) and Load Allocations (LA) allotted to point and non-point sources of pollution. Although this is the standard protocol for TMDL development when the data is incomplete, it is not practical for an arid watershed. The San Jacinto River Watershed is characterized by floods and droughts. Based on the historic hydrologic record, flow proportioned water quality monitoring over the entire SJRWatershed will only occur at a frequency of one (1) time per six (6) years, which translates into three (3) samplings periods over 20-years. Furthermore, even during the rare wet year, the San Jacinto River only flows for three months. This infrequent monitoring is insufficient to fully implement the TMDL Program in a timely manner. Different environmental factors require a different approach.

Achievable Goal & Reasonable Pollution Control:

The attainment of the Nutrient TMDL Program's modest near-term goal for the algae biomass indicator (chlorophyll-a = 40 ug/L) in Lake Elsinore was nearly achieved during the year 2000-2001. Based on data collected by the Santa Regional Water Quality Control Board the mean chlorophyll-a value for that year was 52 ug/L. The monitoring year of 2000-2001 was preceded by 2-3 dry years with no inflow to the Lake. This demonstrates that in just a few years without nutrient pollution to the Lake it is possible to reduce algal levels low enough to approach the near-term goal. Implementing remediation measures such as lake stabilization, aeration and fishery enhancement will further reduce algal levels to achieve the algal biomass goal.

A large shallow lake that is the terminus of a large watershed and located in a sunny, arid region is ecologically hyper-sensitive to nutrient pollution. No one knows the natural trophic state of Lake Elsinore before European civilization began changing the San Jacinto River Watershed over 150 years ago. The results of an on-going sediment geochronology study may clarify when cultural eutrophication began to escalate. In the meantime, a glimpse of past water quality of the San Jacinto River may be found in the SARWQCB's current monitoring of the land use designation for Open Space/Forest. By no means should we consider this land to be the native condition, as logging and cattle ranching have occurred in this area, but it is the closest representative. The concentration of phosphorus measured in the San Jacinto River at the Cranston gauging station, near Idyllwild, is consistently below 0.1 mg/L. This concentration is 5-times lower than the phosphorus concentration that typically flows into Lake Elsinore. Hence, somewhere between the San Jacinto Mountains and Lake Elsinore the phosphorus pollution to the river increases 500%.

No Reasonable Assurance for Implementation in a Reasonable Period of Time:

The revised 10-Year running average for LA and WLAs is at odds with the SARWQCB's 5-Year schedule to consider revisions to the TMDL. Compliance with the Nutrient TMDL allocations should be the primary consideration for the 5-Year assessment by SARWQCB, but this is not possible when the compliance schedule is extended for 10-years. The 10-year running average allocation approach was proposed to account for the varied hydrologic conditions, but given the unpredictability of hydrology the next 10-years may not be representative either. The compliance and review schedules should coincide. Hydrologic conditions, nutrient concentrations and loadings from the San Jacinto River should be considered during the 5-Year assessment of the TMDL, with subsequent adjustments made based on the actual conditions over that period of time.

Recommendation: Set cumulative nutrient allocations at 5-Year running average to coincide with the SARWQCB's 5-Year schedule for considering revisions to the TMDL.

Gradual Reduction in Phosphorus Concentration & Loadings:

Based on the past 73 year hydrologic flow data the mean annual average volume of water that spills from Canyon Lake to Lake Elsinore is approximately 7,000 acre-feet. A realistic approach to attain the TMDL goals would require a gradual reduction in the nutrient loadings from the San Jacinto River to Lake Elsinore.

So too, recent analysis by CH2M-Hill and the University of Riverside indicates that the volume of the local annual stormwater runoff is approximately 2,000 acre-feet. The phosphorus Waste Load Allocation for local urban runoff to Lake Elsinore is only 124 kg/year. Therefore, the urban stakeholders would be required to lower Total Phosphorus concentrations in the stormwater to 0.05 mg/L to meet the TMDL compliance by 2015. This concentration of TP is too low to be met in a reasonable timeframe and much more restrictive than upstream stakeholders.

Recommendation: Revise WLAs & LAs based upon using an approach similar to the spreadsheets below.

WLA & LAs from Canyon Lake Watershed to Lake Elsinore:

Year	Canyon Lake Spills Volume (AF/Yr)	Total Phosphorus (mg/L)	Total Phosphorus (Kg/Yr)
2005	7,000	0.45	3,893
2006	7,000	0.40	3,461
2007	7,000	0.35	3,028
2008	7,000	0.30	2,596
2009	7,000	0.25	2,163
5-Year Average	35,000	0.35	15,141
2010	7,000	0.22	1,903
2011	7,000	0.20	1,730
2012	7,000	0.18	1,557
2013	7,000	0.16	1,384
2014	7,000	0.14	1,211
5-Year Average	35,000	0.18	7,787
2015	7,000	0.10	865
2016	7,000	0.09	779
2017	7,000	0.08	692
2018	7,000	0.07	606
2019	7,000	0.06	519
5-Year Average	35,000	0.08	3,461
2020	7,000	0.05	433

Local Urban Stormwater Runoff WLA to Lake Elsinore:

Year	Local Stormwater Volume (AF/Yr)	Total Phosphorus (mg/L)	Total Phosphorus (Kg/Yr)
2005	2,000	0.45	1,112
2006	2,000	0.4	989
2007	2,000	0.35	865
2008	2,000	0.3	742
2009	2,000	0.25	618
5-Year Average	10,000	0.35	4,326
2010	2,000	0.22	544
2011	2,000	0.2	494
2012	2,000	0.18	445
2013	2,000	0.16	396
2014	2,000	0.14	346
5-Year Average	10,000	0.18	2,225
2015	2,000	0.1	247
2016	2,000	0.09	222
2017	2,000	0.08	198
2018	2,000	0.07	173
2019	2,000	0.06	148
5-Year Average	10,000	0.08	989
2020	2,000	0.05	124

Develop Timely Monitoring, Source-tracking, Accountability and Compliance Procedures:

For the TMDL Program to succeed it must link phosphorus pollution to land use, then to an individual, agency or organization that is accountable for making the needed corrections. The current monitoring plan formulated under the Nutrient Source Assessment does not achieve this objective. There are only eighteen flow-proportioned sampling stations throughout the 760-square mile San Jacinto River Watershed. It's implausible that these few stations can quantify the phosphorus loadings from multiple land uses followed by an assessment of load allocations to responsible parties.

Assessment of load allocations from such few flow proportioned sampling stations is compounded by the collection of samples in an arid watershed. Based on the historic hydrologic record, flow proportioned water quality monitoring may only occur at a frequency of one (1) time per six (6) years, which translates into three (3) samplings periods over 20-years. Furthermore, even during the rare wet year, the San Jacinto River only flows from the mountains to the lakes for three months.

Flow proportioned sampling stations have an estimated capital cost of \$15,000; more importantly, the annual Operating Cost is another \$15,000. The high flow volume required to collect meaningful data from these stations is too infrequent. Furthermore, it's difficult or almost impossible to link the data from the stations to a responsible party to effect a change in land use practices.

Phosphorus Load Allocations (LAs) and Waste Load Allocations (WLAs) are calculated by multiplying the water flow volume by the phosphorus concentration (mg/L). There is nothing inherently polluting from the volume of water flowing to the lakes. In contrast, the concentration of a pollutant contained in the flowing water fundamentally determines the mass of pollutant transported.

The SARWQCB has no reason to limit the volume of flow from the San Jacinto River. If phosphorus LAs & WLAs are established under moderate flow volumes, then at high flow volumes either the phosphorus concentration must be lowered or an increase in the allocations must be permitted to meet the requirements. If allocations are adjusted for flow volume, then the TMDL is just a concentration based program.

A single flow proportioned sampling station for monitoring a large area with multiple and ever changing land uses over the 20-year TMDL program may prove to be unfair to some stakeholders. For instance, an agricultural stakeholder may implement sufficient control measures to reduce nutrient pollution from their property, but be held in violation of the TMDL load allocation based on the failure of the urban stakeholders. A maximum threshold nutrient concentration would ensure all stakeholders are meeting some minimum requirement to reduce nutrient pollution.

Recommendation: Develop a secondary phosphorus concentration threshold of 0.5 mg/L for flowing water in all tributaries to the San Jacinto River to facilitate pollutant source-tracking, timely "cause & effect" compliance, equity and reduced sampling costs.

Concentrate Efforts on Phosphorus Reduction:

The San Jacinto Nutrient Management Plan imperfectly lumps together nutrients (nitrogen & phosphorus) as the cause of impairment to the waterbodies. This may inadvertently misdirect limited resources to control nitrogen, when phosphorus is the major problem. I believe nitrogen fixing by cyanobacteria will prevent any meaningful reduction of nitrogen to the lakes sufficient enough to limit algal growth. Nitrogen is a transient element with the majority of nitrogen addition to Lake Elsinore coming from the atmosphere and losses through volatilization of ammonia and denitrification. In contrast, phosphorus is a conservative element that is only added to the Lake through inflows. Once phosphorus is added to the Lake it persists in the aquatic environment to fuel future algal growth for decades past the time of the original addition.

Water quality indicators, bioassays and nutrient studies demonstrate that phosphorus is the primary limiting agent for algal growth in Lake Elsinore. For example, the concentration ratio of nitrogen to phosphorus is greater than 15:1, which indicates phosphorus is limiting. Bioassays with separate spiked additions for nitrogen and phosphorus only showed algal growth under phosphorus addition (Anderson 2000). It can be deduced from nutrient studies conducted following a prolonged dry period, with no inflows, that nearly all the nitrogen added to the Lake is generated internally through nitrogen fixing blue-green algae.

I don't believe any case studies exist to prove that a substantial reduction in nitrogen loadings alone in a watershed, without phosphorus reduction, is feasible to reverse the similar eutrophic conditions faced by Canyon Lake and Lake Elsinore.

The best way to control nitrogen input to Lake Elsinore is to limit phosphorus. A reduction in phosphorus will reduce the biomass of nitrogen fixing cyanobacteria, which, in turn, will reduce the major source of nitrogen to the Lake.

Recommendation: Establish a total ammonia water quality standard for the San Jacinto River. Raise the total nitrogen target based on the high end guidance ratio for TN:TP of 15:1 or completely eliminate the TN target, then adjust or eliminate TN allocations for Lake Elsinore.

Immediately Implement Reasonable Nutrient Reductions Measures

The TMDL Implementation Plan should make concrete recommendations for changing land use practices in the watershed and a timetable for compliance. The whole purpose of implementing a TMDL program, with water quality based standards, is due to the failure of technology based (BMPs) standards to protect Lake Elsinore over the past 25-years. Below are a few examples of the problems.

The SARWQCB conducted an extensive study on dairy manure entitled "Dairies and Their Relationship to Water Quality Problems in the Chino Basin" (July-1990). According to this report the SARWQCB currently limits manure spreading to croplands to 12-tons/acre/year based on agronomic application rates for nitrogen. This total nitrogen application rate meets the nitrogen requirement for the types of crops produced in the region. However, dairy manure contains a disproportionate amount of phosphorus per unit of nitrogen. Approximately 400-pounds of nitrogen

and 244-pounds of phosphorus are contained in 12-tons of dairy manure. This results in nitrogen to phosphorus ratio of 1.6:1. In contrast, plants require approximately 8-times more nitrogen than phosphorus. Therefore, the spreading of 12-tons of manure per acre on cropland to meet the nitrogen requirement for plants, results in an excess application of phosphorus by over 400%.

The 2002 ANNUAL REPORT OF ANIMAL WASTE DISCHARGE by the Santa Ana Regional Water Quality Control Board shows that the annual disposal of dairy manure to the San Jacinto River Watershed equates to 237,887 tons of local production and another 417,636 tons imported from the Chino Basin. The maximum amount of manure permitted by the SARWQCB's Waste Discharge Requirements equals 12-tons per acre per year, therefore the total amount (655,523 tons) of manure generated or imported to the watershed must be spread on 54,627 acres. Each ton of manure contains approximately 20.3-pounds of phosphorus, which equates to a total of 13,307,117-pounds of phosphorus per year added to the San Jacinto River Watershed. It is apparent from these staggering figures that the improper use of dairy manure can substantially impact surface water quality.

Soil testing should be required prior to the application of manure to cropland to assess the current availability of phosphorus in the soil. For instance, according to the USDA if soil testing shows phosphorus levels exceeding 150 ppm TP, then no phosphorus needs to be applied with the exception of a maximum of 20-lbs/acre of starter P_2O_5 for certain row crops.

The current "Basin Plan" recognizes that non-point source pollution represents the greatest threat to surface water quality. In the past, the SARWQCB has had limited authority and wherewithal to control non-point sources of pollution from agricultural lands. However, dairy manure is generated from a point source, thus the use of manure can be and is regulated through "waste discharge requirements". The SARWQB should take this opportunity, when developing the TMDL Program, to revise the definition of "agronomic" application rates for dairy manure spreading to be based on the primary element (phosphorus) impairing the beneficial use of water within the drainage area.

The TMDL Implementation Plan does include a voluntary development and implementation of a Nutrient Management Plan by agriculture. The NMP would require a study of agronomic application rates for guidance in fertilizer and manure application; however funding of the study and a timetable for implementation is lacking. Most of this data already exists and should be gleaned from the scientific literature, then implemented. The burden of proof to increase the application of nutrients above existing USDA guidelines should fall on the Stakeholders.

Recommendation: Require soil testing and agronomic manure application rates for the "pollutant of concern" (phosphorus) based on existing U.S. Department of Agriculture guidelines. Implementation of Nutrient Management Plans by Agriculture should be mandatory, not voluntary.

Reclaimed water is an important resource that must be used wisely to support all the beneficial uses of water in the watershed. Use of reclaimed water in the SJR Watershed includes irrigation of golf courses, nurseries, municipal streetscapes & farmland, as well as enhancement of wetlands & duck ponds. These multiple uses of reclaimed water provide a significant benefit to supplement the region's water supply.

The production and use of reclaimed water throughout the San Jacinto River Watershed should not be counterproductive to the Nutrient TMDL Program. Under the current NPDES Permits for the Publicly Owned Treatment Works within the Watershed, there are no quantifiable limits or minimum technology based standards for the amount of phosphorus contained in reclaimed water.

Approximately 35,000 acre-feet of reclaimed water is annually distributed to multiple land uses within the San Jacinto River Watershed. This translates into about 190,000 pounds of phosphorus (2.0 ppm TP) distributed throughout the SJR Watershed each year. Although some phosphorus is removed by irrigation of golf courses, nurseries, municipal streetscapes, farmland, wetlands & duck ponds; there is little quantifiable removal of the phosphorus pollution contained in the reclaimed water. Even if these multiple uses have some phosphorus removal capability, none of them should be considered a substitute for proper wastewater treatment.

End users of reclaimed water purchase this product for the water, not the nutrients. For consistency, the Nutrient TMDL Program should require all Publicly Owned Treatment Works selling reclaimed water in the San Jacinto River Watershed to meet the minimum standard for treatment of the pollutant that is impairing the local water-bodies prior to the sale and distribution of reclaimed water from their facilities.

No other chemical parameter regulated by Waste Discharge Requirements allow for the removal of pollutants by the end user. For example, when reclaimed water or biosolids are applied to land, no removal credits are allowed for pathogens (coliform bacteria indicator), heavy metals, nitrogen, pH or settleable solids. Why would the SARWQCB allow a lower standard for phosphorus pollution upstream of a waterbody impaired by phosphorus?

Public agencies, such as Publicly Owned Treatment Works, are a reflection of society as a whole and should set an example for other industries to follow. POTWs should meet the minimum standard for treatment of a pollutant that is impairing the local waterbody prior to discharge of reclaimed water off-site of their facility. Therefore, the Santa Ana Regional Water Quality Control Board should require all reclaimed water utilized in the Lake Elsinore/San Jacinto River Watershed to meet the minimum standard of best available technology (BAT) economically achievable for the removal of nutrients.

Recommendation: Revise waste discharge requirements for the use of reclaimed water in the Lake Elsinore/San Jacinto River Watershed to meet the minimum treatment standard of best available technology (BAT) economically achievable for the removal of nutrients.

Water Quality focus for all Pollutant Trading:

All pollutant trading should be based upon scientifically defensible improvements to water quality. Not all pollutant trading is equal. For example, soluble (reactive) ortho-phosphorus is bio-available to algae for immediate uptake and assimilation; where as a substantial fraction of particulate phosphorus is not bio-available to algae. Seemingly equal loadings of SRP versus Particulate-P would result in substantially different affects on water quality.

Additionally, nutrient loadings are not the sole determiner of water quality in Lake Elsinore. The quantity of water in the Lake substantially affects water quality. Lake Elsinore's high phosphorus internal load can be partially mitigated by the addition of a sufficient quantity of water.

Recommendation: All Pollutant Trading proposals shall be considered and approved by the SARWQCB based upon scientifically defensible improvements to water quality that conform to the attainment of the algal biomass and dissolved oxygen response indicators for the interim and final TMDL.

Supplemental water WLA is unrelated to LA for agriculture:

It should be stated in the Nutrient TMDL Program that there is no relationship between the Waste Load Allocation for supplemental water and the limited Load Allocation for agriculture. Based on the unusual hydrologic condition of the SJR-Watershed, the supplemental water will only be added in years with low inflow from the San Jacinto River Watershed.



Adopted by TNRCC: February 2001
Approved by EPA: December 2001

Two Total Maximum Daily Loads for Phosphorus in the North Bosque River

For Segments 1226 and 1255

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Prepared by:
The Strategic Assessment Division, TNRCC

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION



United States
Department of
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Natural
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Conservation
Service

Economic
Research
Service

Manure Nutrients Relative to the Capacity of Cropland and Pastureland to Assimilate Nutrients:

Spatial and Temporal Trends for the United States

Robert L. Kellogg, Ph.D.

Natural Resources Conservation Service
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**Manure Nutrients Relative to the Capacity of Cropland and Pastureland to Assimilate Nutrients:
Spatial and Temporal Trends for the United States**

(The assimilative capacity parameters used for cropland used as pasture are based on the assumption that the land was frequently rotated with cropland. In the census, however, some of the land designated as *cropland used as pasture* is rarely used as cropland. Where this is the case, the assimilative capacity has been overstated. Using the per acre assimilative capacity assumptions for permanent pastureland (28 pounds per acre for nitrogen and 11 pounds per acre for phos-

phorus) to represent per acre assimilative capacity for cropland used as pasture, estimates of total assimilative capacity were 7 percent lower for nitrogen and 19 percent lower for phosphorus nationally. In some areas of the country (Hawaii, West Virginia, Oklahoma, Texas, and Alabama), total assimilative capacity estimates were as much as 25 percent lower for nitrogen and 35 percent lower for phosphorus.)

Table 9 Nutrient uptake parameters for 24 crops used to estimate assimilative capacity of cropland

Crop	Yield unit	-- Pounds of nutrients per yield unit --		-- Pounds of nutrients per ton of product --	
		Nitrogen	Phosphorus	Nitrogen	Phosphorus
Corn for grain	bushels	0.80	0.15	28.57	5.36
Corn for silage	tons	7.09	1.05	7.09	1.05
Soybeans	bushels	3.55	0.36	118.33	12.00
Sorghum for grain	bushels	0.98	0.18	35.00	6.43
Sorghum for silage	tons	14.76	2.44	14.76	2.44
Cotton (lint and seed)	bales	15.19	1.89	60.76	7.56
Barley	bushels	0.90	0.18	37.50	7.50
Winter wheat	bushels	1.02	0.20	34.00	6.67
Durum wheat	bushels	1.29	0.22	43.00	7.33
Other spring wheat	bushels	1.39	0.23	46.33	7.67
Oats	bushels	0.59	0.11	36.88	6.88
Rye for grain	bushels	1.07	0.18	38.21	6.43
Rice	bags	1.25	0.29	25.00	5.80
Peanuts for nuts (with pods)	pounds	0.040	0.003	80.00	6.00
Sugar beets for sugar	tons	4.76	0.94	4.76	0.94
Tobacco					
IN, MO, OH, and WV	pounds	0.0298	0.0024	59.60	4.80
KY	pounds	0.0299	0.0024	59.80	4.80
NC	pounds	0.0329	0.0020	65.80	4.00
TN	pounds	0.0302	0.0023	60.40	4.60
VA	pounds	0.0322	0.0021	64.40	4.20
all other states	pounds	0.0330	0.0020	66.00	4.00
Potatoes	bags	0.36	0.06	7.20	1.20
Sweet potatoes	bushels	0.13	0.02	5.20	0.80
Alfalfa hay	tons	50.40	4.72	50.40	4.72
Small grain hay	tons	25.60	4.48	25.60	4.48
Other tame hay	tons	19.80	15.30	19.80	15.30
Wild hay	tons	19.80	15.30	19.80	15.30
Grass silage	tons	13.60	1.60	13.60	1.60
Sorghum hay	tons	2.39	1.01	2.39	1.01

Note: Values in this table are the same as those previously published by Lander, Moffitt, and Alt (1998).



RIVERSIDE COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT

June 3, 2004

Mr. Gerard J. Thibeault
Executive Officer
California Regional Water Quality
Control Board - Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501-3339

Dear Mr. Thibeault:

Re: Comments on Draft Lake Elsinore
and Canyon Lake Nutrient TMDL
Technical Report

The Riverside County Flood Control and Water Conservation District (District) is the Principal Permittee on the Riverside County municipal separate storm sewer system (MS4) permit. In consultation with and on behalf of the Permittees in the San Jacinto watershed, the District is submitting the following comments on the Draft Lake Elsinore and Canyon Lake Nutrient TMDL Technical Report (Draft TMDL Report).

In summary, the science supporting the interim and final TMDL numeric targets total nitrogen and total phosphorous (numeric targets) proposed in the Draft TMDL Report is preliminary, yet the cost to the Permittees to comply with the proposed numeric targets are so significant as to render them infeasible. We have estimated the costs of compliance with the proposed TMDL numeric targets to potentially exceed hundreds of millions of dollars. There are four reasons for the significant financial impact:

1. Due to insufficient data, several conservative assumptions were made in the process of establishing the TMDLs. These assumptions led to the development of overly conservative (i.e., unnecessarily low) numeric targets.
2. The final TMDL numeric targets are at the extreme limit of existing BAT/BCT wastewater BMP technologies for removal of total nitrogen and phosphorous.
3. The interim TMDL numeric targets are beyond the treatment capabilities of conventional stormwater BAT/BCT based BMP technologies for removal of total nitrogen and phosphorous.
4. The wastewater and stormwater BMP technologies best capable of achieving the proposed TMDL numeric targets are expensive to implement and are only fiscally feasible for treating small volumes of runoff. These technologies are neither physically nor fiscally feasible for treatment of the large volumes of stormwater runoff that occurs during the wet year events.

The Permittees do not believe that it is the intention of the Board to impose TMDL numeric targets that would place the Permittees in a situation of unavoidable non-compliance. To successfully implement programs to improve the water quality in Canyon Lake and Lake Elsinore it is critical that the TMDLs adopted by the Board be technologically and fiscally feasible. The balance of this letter discusses the deficiencies in the TMDL model, the realistic expectation of results from implementation of the proposed TMDL numeric targets and the need for an economic analysis of impacts. The letter will also propose necessary revisions to the implementation plan, and provide recommendations for improvement of the proposed TMDLs and the science supporting it. Supporting data is provided where available. Specific and detailed position papers relative to each of these topics are also attached.

The modifications to the Draft TMDL Report released on Tuesday May 25, 2004 were extensive. Although the Permittees have determined that the proposed TMDL numeric targets are not technologically or fiscally feasible, we have not had sufficient time to fully review the Draft TMDL Report. Therefore, we are only able to submit preliminary comments at this time.

TMDL Numeric Limit Deficiencies

The Draft TMDL Report indicates that significant empirical data was collected regarding total phosphorus dynamics in Lake Elsinore. However, data did not exist to perform similar levels of analysis on numeric targets for total nitrogen at Lake Elsinore or for either total nitrogen or total phosphorus at Canyon Lake. Attachment A of the Draft TMDL Report states that the following assumptions were made for the purposes of margin of safety (MOS) to ensure that beneficial use objectives were met:

1. The derivation of numeric targets based on the 25th percentile of data for both lakes;
2. The use of conservative literature values in the absence of site-specific data for source loading rates in the watershed nutrient model;
3. The use of conservative assumptions in modeling the response of Lake Elsinore and Canyon Lake to nutrient loads; and
4. Requiring load reductions to be accomplished during hydrological conditions when model results indicate, in some instances, that theoretical loads could be higher.

Are TMDL Targets Realistic?

Based on a review of recent scientific literature, the proposed TMDL numeric targets derived from the conservative assumptions are not technologically feasible. It is unrealistic to expect attainment of the proposed numeric targets based on the conservative assumptions identified above. The following table briefly summarizes the Permittees research relative to the numeric targets:

Santa Ana Regional Water Quality Control Board

Re: Comments on Draft Lake Elsinore and

Canyon Lake Nutrient TMDL Technical Report

PARAMETER	IRREDUCIBLE CONCENTRATION	LAKE INTERIM TARGET	WASTEWATER TREATMENT PLANT INTERIM TARGET	LAKE FINAL TARGET	WASTEWATER TREATMENT PLANT FINAL TARGET
Total Phosphorus	0.15 – 0.2 mg/L	0.1 mg/L	0.5 mg/L	0.05 mg/L	0.2 mg/L
Total Nitrogen	1.9 mg/L	1.0 mg/L	1.0 mg/L	0.5 mg/L	1.0 mg/L

The first column of the table indicates results of a study performed by the Center for Watershed Protection¹ that indicates the minimum irreducible concentrations that can be achieved based on current common treatment control technologies for stormwater. The values from the first column can be compared with the interim and final numeric targets established for the lakes (lake interim and final targets) and with the separate numeric targets established for discharges from wastewater treatment plant operators who provide supplemental water within the watershed (wastewater treatment interim and final targets). It is clear from a comparison that the interim and final numeric targets for the lakes are below the irreducible concentrations for total nitrogen and total phosphorus. It is also clear that the interim and final targets for the wastewater dischargers are significantly higher than the lake numeric targets, and in line with the irreducible discharges identified by the Center for Watershed Protection. If the discharges from advanced wastewater treatment plants cannot meet the numeric targets for the lakes, it is unreasonable to expect that any stormwater treatment process available to the watershed dischargers would be capable of meeting the proposed TMDL numeric targets!

In addition to technologic infeasibility, based on a review of the literature, compliance with the proposed numeric targets are not fiscally feasible for the watershed dischargers. As previously stated, the available wastewater and stormwater treatment technologies are expensive to implement and are only fiscally feasible for treating small volumes of water (the proposed Lake Elsinore treatment plant upgrade to add chemical total phosphorus treatment and filtration would treat approximately 8 MGD, at a cost of \$1.4 million). Existing stormwater BMP technologies are also designed to treat small volumes of water, often less than 8 MGD (12.5 cfs). To illustrate this, consider that the Perris Valley Channel alone is designed to convey over 7,750 MGD, or nearly 1,000 times the volume of water treated at the current Lake Elsinore treatment plant. Further, when attempting to use BMPs to treat to the limits of a BMPs capability (irreducible concentration), treatment efficiencies tend to drop significantly for influent concentrations which are already as low as with stormwater nutrient concentrations).

The following table provides a preliminary estimate of the land costs for wetlands required for treatment of stormwater runoff at various inflow rates. The table also identifies influent concentration based on historical monitoring data and estimates of effluent concentrations based on wetland treatment. The costs presented in the last two columns are only for land costs and do not include costs for dry weather water demands, planting, operation or maintenance:

¹ *Irreducible Pollutant Concentrations Discharges from Stormwater Practices*, article 65, The Practice of Watershed Protection, editors Thomas R. Schueler and Heather K. Holland, published 2000 by the Center for Watershed Protection, Ellicott City, MD.

Santa Ana Regional Water Quality Control Board

Re: Comments on Draft Lake Elsinore and
Canyon Lake Nutrient TMDL Technical Report

Q _o (cfs)	Total Nitrogen		Total Phosphorus		Wetlands Area (ac)	Land Cost ²	
	TN _o (mg/L)	TN _r (mg/L) ³	TP _o (mg/L)	TP _r (mg/L) ⁴		Low	High
10 ⁵	3.04	1.51	0.66	0.10	3,620	\$ 18.1 M	\$94.1 M
104 ⁶	2.02	1.51	0.53	0.10	27,264	\$136.3 M	\$708.8 M
3710 ⁷	4.20	1.51	1.07	0.10	3,236,045	\$16.2 B	\$84.1 B

An evaluation of treatment technologies to achieve the TMDL targets in the watershed is presented in Attachment B. As described in this evaluation of wetlands treatment, the evaluation concludes that treatment to achieve the proposed TMDL numeric targets is fiscally infeasible.

Need for Economic Analysis

The proposed TMDL numeric targets for total nitrogen and total phosphorus are not fiscally achievable. The costs to achieve the proposed TMDL target receiving water concentrations and the relative value of the expected improvements in attainment of beneficial uses must be fully identified and considered in the issuance of the TMDLs. Section 13241 of the California Water Code specifically states that economic considerations must be considered by the Regional Board. The Superior Court of California has ruled that in amending a basin plan to include a TMDL, the same considerations must be made in the proposed TMDL as was in the adoption of the original basin plan:

“Under the applicable statutory scheme Basin Plans (1) identify beneficial uses of water bodies to be protected; (2) establish water quality objectives to protect those uses; and (3) establish implementation programs for achieving the objectives.

As such, Respondents are incorrect in stating no water quality objectives are implemented. It may be true the Basin Plan was only amended to add the TMDL, but if the TMDL was originally part of the Basin Plan it necessarily would have made economic considerations under Section 13241. It is certainly reasonable to conclude that when amending the Basin Plan the same considerations should be made.”⁸

Attachment C explains this ruling in further detail. However, irrespective of any mandatory requirements to do so, the citizens of California justifiably expect their public decision-makers to fully assess the costs of proposed programs and requirements and to assess whether the anticipated benefits justify these costs.

² Based on San Jacinto River planning estimates for right-of-way acquisition – \$5000/ac to \$26,000/ac.

³ Based on equation from Minton, 2002 – A total nitrogen effluent concentration less than 1.5 mg/L yields a complex solution.

⁴ Interim TMDL goal.

⁵ Hydron Data for 1998 readings at Perris-Nuevo USGS station.

⁶ Hydron Data for 1998 readings at Elsinore USGS station.

⁷ USGS highest daily mean for February 24, 1998, at Elsinore USGS station

⁸ Statement of Decision. The City of Arcadia, et al versus The State Water Resources Control Board and the California Regional Water Quality Control Board, Los Angeles Region. Filed December 24, 2003. Page 13, lines 11-18.

Implementation Schedule

Several new projects and measures have recently been implemented or will be implemented within the San Jacinto watershed over the course of the next year. These programs include the implementation of the Permittee's Water Quality Management Plan for new development and redevelopment, a dredging project at Canyon Lake, and the Island Well Improvements at Lake Elsinore. The Permittees request that the TMDL implementation plan be revised to allow for the evaluation of the management measures either implemented or scheduled for implementation during the first five years (2005 – 2010) of the TMDL. In addition, we request that the TMDL specify that the first five years of the TMDL will be used to collect additional watershed and lake monitoring data, and implement test projects to analyze the effectiveness of potential nutrient control BMPs. The TMDL lake and watershed models should then be recalibrated with data collected during the five-year period. The revised results of the TMDL model can then be used to select appropriate management measures and numeric targets of total nitrogen and total phosphorous for implementation.

Recommendations

Based on our analysis of available BMP technologies, costs, and limited availability of local resources to implement the TMDL numeric targets, we have concluded that the Permittees would be in unavoidable non-compliance with the proposed TMDL. Further, this analysis would not be supportive of initiatives to secure additional local funding. Therefore, the Permittees recommend that the Regional Board direct staff take the following actions:

1. Delete the unattainable final numeric target criteria for total phosphorus and total nitrogen;
2. Review the conservative assumptions used to establish the numeric targets to see if the numeric targets can be set at or above the known nutrient irreducible concentrations and still be protective of Beneficial Uses;
3. Incorporate an economic analysis of the costs and benefits of the proposed TMDL;
4. Revise the implementation schedule to provide time to:
 - Allow dischargers to enter into an agreement to jointly fund and operate TMDL compliance programs, including submittal of necessary compliance documents;
 - As noted in the Draft TMDL Report, control of all external sources will not provide water quality benefits until internal sources of nutrients are controlled. The TMDL should therefore take a two-phased approach. The first phase, which may require five years, should focus on control of internal sources and identification controls that can effectively reduce the external loading of nutrients to Canyon Lake and Lake Elsinore.

The first phase should also be used to:

- a. Analyze effectiveness of existing and scheduled nutrient control projects;
- b. Implement additional pilot nutrient control projects for both internal and external sources to determine which controls are effective and economically feasible;
- c. Gather and refine additional runoff and water quality data to accurately model the wet year runoff conditions;

June 3, 2004

- d. Further develop the TMDL lake and watershed models and re-evaluate the TMDL numeric targets;

The second phase should require implementation of identified controls, as applicable and necessary, throughout the watershed. The Permittees believe that additional watershed controls should not be implemented until technologically effective and fiscally feasible programs for control of internal sources of nutrients can be implemented.

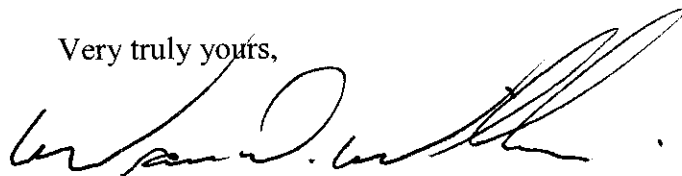
Additional recommendations and comments are provided in the attached position papers. The Permittees are submitting these initial comments as part of an on-going, open dialogue with the Regional Board to help develop appropriate, effective and workable TMDLs for Lake Elsinore and Canyon Lake. The Permittees are committed to water quality protection in a manner that balances this objective with the universe of needs and expectations of the citizens of California within the San Jacinto River watershed. We look forward to discussing the initial concerns of the Permittees and our proposal to work collaboratively to resolve these concerns at the June 4, 2004, Regional Board workshop.

In support of the District's position, the following documents are attached:

Attachment A – TMDL Nutrient Data Deficiencies
Attachment B – Are the TMDL Targets Realistic?
Attachment C – Need for Economic Analysis
Attachment D – Implementation Schedule
Attachment E – Recommendations
Attachment F – Report-specific comments

Please contact Stephen Stump at 909.955.8411 or Jason Uhley at 909.955.1273 of our Regulatory Division if you have any questions.

Very truly yours,



WARREN D. WILLIAMS
General Manager-Chief Engineer

JEU:LCG:ABC:cw
Attachments

PC/88370

TMDL NUTRIENT DATA DEFICIENCIES

The following assumptions were made in the Draft Report based on the best available information to develop Margins of Safety (MOS) to ensure that Beneficial Use objectives were achieved:

1. The derivation of numeric targets based on the 25th percentile of data for both lakes;
2. The use of conservative literature values in the absence of site-specific data for source loading rates in the watershed nutrient model;
3. The use of conservative assumptions in modeling the response of Lake Elsinore and Canyon Lake to nutrient loads; and
4. The requirement of load reductions to be accomplished during hydrological conditions when model results indicate, in some instances, that theoretical loads could be higher.

Based on review of literature and evaluation of implementation costs, the proposed numeric TMDL targets derived from these conservative assumptions are neither technologically nor fiscally feasible. It is unrealistic to expect successful implementation of the proposed TMDL targets that are based on the conservative assumptions listed above.

The Draft Report indicates that significant empirical data was collected regarding total phosphorus dynamics in Lake Elsinore. However, the numeric target for total nitrogen (TN) concentrations was based on commonly accepted and conservative 10:1 ratio to the total phosphorus concentration (page 17). In addition, allowable concentrations for total phosphorus (TP) and TN at Canyon Lake were set based on “consistency with the proposed Lake Elsinore numeric targets” due to a lack of a reference state and supporting data at Canyon Lake (page 21).

It should be noted that the limnology of Canyon Lake is significantly more complex than that of Lake Elsinore. For example, Canyon Lake is sufficiently deep to allow stratification and is capable of trapping nutrients released from the lake sediments in the hypolimnion during the summer and preventing algal blooms (Page 22). Also, despite higher average nutrient concentrations, there is no reliable documentation that fish kills have occurred at Canyon Lake. Specific studies of algal productivity and lake conditions for both Lake Elsinore and Canyon Lake may demonstrate that allowable nutrient concentrations for TN (in both lakes) and TP (in Canyon Lake) can be increased without leading to impairment of beneficial uses. Increasing the allowable nutrient concentrations in the lakes could exponentially reduce compliance costs for Permittees.

Further, the Draft Report summarizes the findings of studies and models that have determined that the primary sources of nutrients leading to the impairment of Canyon Lake and Lake Elsinore are accumulated sediments. Two targets are proposed to reduce nutrient loading to Lake Elsinore – an interim 35% internal lake nutrient load reduction by 2015 and a final 70% internal lake nutrient load reduction by 2020. Although several in-lake nutrient control projects have been initiated at Lake Elsinore, their effectiveness has not been determined. During the TMDL Workgroup meetings, members of the Lake Elsinore and San Jacinto Watershed Authority (LESJWA) were not confident that the existing or soon-to-be completed in-lake

ARE TMDL TARGETS REALISTIC?

The Draft TMDL report uses the best available scientific information to determine the proposed TMDLs for nutrients necessary to protect the beneficial uses of Lake Elsinore and Canyon Lake. Based on this science, the Draft TMDL Report specifies a concentration based interim and final numeric target for the TMDLs, but does not analyze the technological feasibility or fiscal capability of the dischargers in the watershed to achieve the numeric targets. Based on our analysis, it is technologically and fiscally infeasible to meet the TMDL numeric targets.

It is important to note that Lake Elsinore, although one of the few natural lakes in Southern California is, in its natural state, eutrophic. The Draft Report clearly identifies that Lake Elsinore has been subject to extreme conditions including periods of a dry lakebed and extreme flooding. The eutrophic conditions, as well as sedimentation and fish kills, predate urbanization of the watershed (page 15). The beneficial uses identified for Lake Elsinore in the Basin Plan could not be attained under natural conditions. These beneficial uses can only be supported through the implementation of extreme and costly measures.

The Draft Report summarizes the findings of studies and models that have determined that the primary sources of nutrients leading to the impairments are the accumulated sediments within Canyon Lake and Lake Elsinore. These internal sources of nutrient loading are much greater than external nutrient loading from the watersheds. Without control of the internal sources of nutrients (e.g., sediment removal and/or sediment encapsulation) the proposed final nutrient targets cannot be met, even with complete elimination of external sources. The Draft TMDL Report proposes two targets to reduce in-lake nutrient loading at Lake Elsinore, an interim 35% reduction by 2015 and a final 70% reduction by 2020. For reasons identified below, it is likely that neither the interim nor final in-lake nutrient reductions are feasible. Without the specified in-lake nutrient reductions, expending the resources to meet the assigned Waste Load Allocations (WLAs) and Load Allocations (LAs) for the upstream watershed dischargers would not provide the desired water quality benefit.

The Permittees have reviewed available literature and interviewed various experts regarding the ability of existing stormwater and wastewater BMPs to reduce stormwater and wastewater nutrient loads to the specified numeric targets. These experts included staff at Orange County Water District who are implementing the Prado Wetlands, including Dr. Stephen Lyon and the author of Stormwater Treatment, Dr. Gary Minton. The TMDL targets are unachievable using current stormwater or wastewater BMP technology. This is documented in “Urban Stormwater BMP Performance Monitoring”¹, which presents a table of “irreducible concentrations” of selected parameters, the lowest concentration that can be achieved using existing BMPs. The table, reprinted below, and modified to include the interim and final numeric targets for the watershed dischargers and the interim and final numeric targets for wastewater treatment plant (supplemental water) discharges is:

¹ Urban Stormwater BMP Performance Monitoring, Table 2.9, pg. 33, prepared by GeoSyntec Consultants, Urban Drainage and Flood Control District, and Urban Water Resources Council of ASCE, in cooperation with EPA Office of Water, April 2002.

PARAMETER	IRREDUCIBLE CONCENTRATION	WATERSHED INTERIM TARGET	WASTEWATER TREATMENT PLANT INTERIM TARGET	WATERSHED FINAL TARGET	WASTEWATER TREATMENT PLANT FINAL TARGET
Total Phosphorus	0.15 -- 0.2 mg/L	0.1 mg/L	0.5 mg/L	0.05 mg/L	0.2 mg/L
Total Nitrogen	1.9 mg/L	1.0 mg/L	1.0 mg/L	0.5 mg/L	1.0 mg/L

The irreducible concentrations for TN and TP are almost twice their respective interim targets, indicating that the interim targets, much less the final targets, may be unachievable with current BMP technology. The unattainability of these standards is further emphasized by the fact that the allowable nutrient effluent concentration from Eastern Municipal Water District's and Elsinore Valley Municipal Water District's wastewater treatment plants are only expected to achieve 0.2 mg/l phosphorus concentrations for the final target (page 73). The Draft Report, in footnote 14, even notes that compliance with this wastewater plant interim numeric objective may not be feasible for the wastewater treatment plants. The Permittees would note that the interim and final phosphorus concentrations, for which all other dischargers are expected to meet, is 0.1 mg/l and 0.05 mg/l – ultimately one tenth of the allowable discharge from the treatment plants. If wastewater treatment plants cannot meet the objectives specified for the lakes, it is unreasonable to expect MS4 dischargers in the watershed to meet the criteria, particularly considering they must manage episodic discharges with 1,000 times the volume experienced at wastewater treatment plants.

The types of technologies for treatment of urban runoff that have the theoretic potential to meet the proposed interim and final TMDL targets include treatment wetlands, filtration systems, and reverse osmosis. Based on technologies currently available, it is unlikely that any reasonably sized single treatment technology will be adequate to achieve the proposed TMDL targets. An analysis of these treatment technologies, including estimated costs, is presented in subsequent paragraphs. Because these technologies would be needed primarily during wet conditions, it is expected that facilities will need to be sized to address large volumes of water (possibly 7,500 MGD just for Perris Channel). Further, the capacity of all of these treatment technologies will be greatly underutilized in other than very wet conditions, which are expected to occur about once every 10 years. With the extremely variable flows that a stormwater treatment facility would encounter, design and construction of a detention facility must be considered in order to retain and meter the volume of stormwater runoff through the treatment system. The detention facilities could result in unintended environmental impacts including vector issues and loss of water supply to the lakes due to evaporation and infiltration at temporary ponding facilities.

Additionally, the effectiveness of classic wastewater BMPs at treating phosphorus and nitrogen is expected to be much lower than wastewater texts would indicate. Concentrations of TN and TP in stormwater runoff are low compared to wastewater influent concentrations; thus, TN and TP reduction/removal from stormwater using conventional wastewater treatment technologies would be limited. For example, Stormwater Treatment, a recent book authored by Dr. Stephen Minton, indicates that the high removal efficiencies achieved by wastewater treatment technologies may be attributed to high influent concentrations of nutrients contained in wastewater. In essence, a stormwater treatment plant with lower influent concentrations would

have to be significantly larger than a wastewater treatment plant to achieve the same effluent concentration².

The cost to implement any of the aforementioned technologies is beyond local funding capabilities. Further, as the TMDL model has many uncertainties, including the fact that it has not been calibrated for wet conditions, municipalities cannot justify the cost and amount of land required to their Boards and constituencies. The following paragraphs address specific design issues and costs relative to constructed wetlands and other wastewater treatment technologies.

CONSTRUCTED WETLANDS

Constructed wetlands are biological treatment systems that have the potential to reduce TN and TP in stormwater. For the purposes of illustration, the estimated area required for a constructed wetland for removal of TP and TN from stormwater runoff was calculated for three flow rates recorded in the watershed. These calculations are based on equations presented in Stormwater Treatment³. The following table summarizes the preliminary design. It should be noted that the largest flow rate, 3,710 cfs, was the peak flow measured just upstream of Lake Elsinore during the 1998 wet season. This is one of the weakest wet seasons on record. The Perris Valley Channel, with a 91 square mile tributary area has recorded flow as high as 6,350 cfs and mainstream San Jacinto River flows could be expected to exceed 30,000 cfs. Please note that it is estimated that an expenditure of \$94 million to acquire 3,620 acres of wetlands would be required to treat even a small flow rate of 10 cfs, or the flow rate that could be expected from a new development under a typical rain event, to the interim phosphorus target. The estimated costs only reflect the cost of land. Costs associated with design, construction and maintenance are not included in the cost estimates below. Note that the interim target (0.10 mg/L) was used for total phosphorus; total phosphorus proved to be the limiting factor and the design is based on the corresponding hydraulic loading rate that would achieve the concentration of 0.10 mg/L TP in the effluent stream. Further, there is no guarantee that this expenditure would result in the numeric target being achieved, as wetland removal rates are erratic at concentrations below 2 mg/L⁴.

² Minton, Gary R., Ph.D., P.E., 2002. Stormwater Treatment: Biological, Chemical, & Engineering Practices. Gary R. Minton. Seattle, WA. Page 282

³ Minton, Gary R., Ph.D., P.E., 2002. Stormwater Treatment: Biological, Chemical, & Engineering Practices. Gary R. Minton. Seattle, WA.

⁴ Minton, Gary R., Ph.D., P.E., 2002. Stormwater Treatment: Biological, Chemical, & Engineering Practices. Gary R. Minton. Seattle, WA. Page 282

LAND COSTS ASSOCIATED WITH CONSTRUCTED WETLANDS FOR THREE DIFFERENT FLOW RATES

Q _o (cfs)	Total Nitrogen		Total Phosphorus		Wetlands Area (ac)	Land Cost ⁵	
	TN _o (mg/L)	TN _r (mg/L) ⁶	TP _o (mg/L)	TP _r (mg/L) ⁷		Low	High
10 ⁸	3.04	1.51	0.66	0.10	3,620	\$ 18.1 M	\$94.1 M
104 ⁷	2.02	1.51	0.53	0.10	27,264	\$136.3 M	\$708.8 M
3710 ⁹	4.20	1.51	1.07	0.10	3,236,045	\$16.2 B	\$84.1 B

The San Jacinto Nutrient Management Plan¹⁰ also evaluated several urban BMPs, including wetlands and wet detention ponds. The report finds that while wetlands and wet detention ponds can reliably remove pollutants, their cost and applicability to most types of development were of poor to medium performance.

In summary, there are several concerns with implementing wetlands. Achieving removal efficiencies decreases during high runoff conditions unless the constructed wetland or wet detention pond is adequately sized to detain the large volume of storm runoff. Adequate sizing for the large volumes of stormwater runoff increases the amount of land area needed to safely detain and treat the incoming storm flow. Also, due to the arid climate in the San Jacinto watershed, maintenance of a wetland setting would require a continuous supply of supplemental water. EPA does not recommend the use of wetlands or wet ponds in semi-arid climates unless supplemental water is provided¹¹. Dry detention basins were also considered, but Constructed wetlands and wet detention ponds have been proven to be more efficient in TN and TP removal compared to dry basins, which have no permanent wet pool.

ALTERNATIVE TREATMENT TECHNOLOGIES

Alternative technologies that may be utilized for treatment of stormwater runoff are commonly used in advanced/tertiary wastewater treatment – sedimentation, precipitation, coagulation, and filtration unit processes. An engineered combination of these biological and physical/chemical technologies may be successful in effectively reducing phosphorus and nitrogen levels in stormwater runoff. However, designing the most effective combination of stormwater treatment technologies would require bench- and pilot-scale studies using actual stormwater runoff from within the watershed.

By varying the type of filter media and combining a series of systems or devices, filtration can be adapted for treatment of stormwater runoff. Media currently being used in stormwater treatment

⁵ Based on San Jacinto River planning estimates for right-of-way acquisition – \$5000/ac to \$26,000/ac.

⁶ Based on equation from Minton, 2002 – A total nitrogen effluent concentration less than 1.5 mg/L yields a complex solution.

⁷ Interim TMDL goal.

⁸ Hydron Data for 1998 readings.

⁹ USGS highest daily mean for February 24, 1998.

¹⁰ Tetra-Tech, Inc. 2004. San Jacinto Nutrient Management Plan: Final Report. Report to Santa Ana Watershed Project Authority (SAWPA). San Diego, CA. (Table 4-9-1)

¹¹ http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post_26.cfm

include amended sands, resins and zeolites; granular polymers (e.g., chitosan); peat; leaf compost; zeolites; and activated carbon. These media are currently most common in manufactured and proprietary stormwater treatment systems and inserts. These technologies are appropriate for application to individual facilities (e.g., an industrial site, commercial facility, portion of a residential development, etc.), but they are not feasible for stormwater runoff treatment at a watershed-level application. For example, the proposed improvements to the Lake Elsinore Treatment Facility to include filtration are proposed to cost \$1.4 million and would treat upwards of 8 MGD. The peak runoff expected from Perris Valley Channel during the 1969 wet year exceeded 4,300 MGD. This would have require approximately 537 times the capacity of the existing Lake Elsinore Treatment Plant at an expenditure likely exceeding \$1 billion. It should also be noted that the peak flow rate of the San Jacinto River at Cranston Bridge would be expected to exceed 43,870 MGD during an extreme wet year. Treatment of stormwater runoff at these levels of flow is not feasible. Further, the capacity of treatment plants designed for wet weather flows would lie dormant for many years between wet weather events. By inspection, these types of treatment technologies are not feasible for treatment of stormwater runoff to meet the TMDL targets. However, a brief description of these technologies follows.

Within the realm of filtration technology includes reverse osmosis (hyperfiltration) – a process where water is separated from dissolved salts in solution by filtering through a semipermeable membrane at a pressure greater than the osmotic pressure caused by the dissolved salts in [a] wastewater.¹² Reverse osmosis has the advantage of removing dissolved organics, including phosphorus, that are less selectively removed by other demineralization techniques. The advantages and disadvantages of reverse osmosis are summarized as follows:

Advantages

- Different membranes with capabilities to separate out an array of substances;
- Different substances are removed at varying efficiencies (nitrogen is removed at higher efficiency than phosphorus);
- New membrane technology (Vandal-ION™) with potential to reduce phosphorus to concentrations <10 ppb.

Disadvantages

- Produces brine water waste that requires disposal (approx. 15-25% of influent).
- Requires operating pressures of 150 – 400 psi.
- High energy costs.
- Membranes are relatively expensive.
- Costly maintenance and replacement of membranes contribute significantly to total treatment cost.
- Some compounds can make the membrane deteriorate or clog (e.g., sediment).
- Water pretreatment important: suspend and remove solid material, anti-scaling treatment, pH adjustment, dechlorination and softening.

Orange County Water District's (OCWD) Water Factory 21 (WF21) in Fountain Valley, CA, contains two parallel reverse osmosis (RO) systems capable of producing 5 MGD of treated (tertiary) wastewater for blending and recharge. The RO systems are only capable of reducing

¹² Metcalf & Eddy, Inc. 1991. Wastewater Engineering: Treatment, Disposal, Reuse. McGraw-Hill, Inc. U.S.A.

TN from 18.3 mg/L to 2.6 mg/L (TP data not provided).¹³ The costs of this particular system are summarized below:

Capital & Construction Costs	\$ 3 Million ¹⁴ (\$10.5 Million in 2002 dollars)
Operating Costs @ Maximum Capacity (5 MGD) ¹⁵	\$312 / acre-foot

Note that influent into the RO systems is much higher than typical stormwater runoff TN levels – an average of 3 mg/L, as at the Perris-Nuevo and Elsinore Stations. As discussed earlier, elevated influent levels prove higher removal efficiencies in treatment technologies.

It should be noted that in 1980, approximately 167,000 acre-feet of flow entered Lake Elsinore. That volume of water is equivalent to the storage capacity of two Lake Elsinores under normal conditions. Providing either the flow treatment capacity (upwards of 4,400 MGD based on historical record, 9,355 MGD based on a 100 yr. design flow for the river at Railroad Canyon) or storage volume necessary to treat the water over time is not feasible. However, to illustrate the point, the cost presuming maximum treatment capacity of 4,400 MGD has been calculated.

Influent volume:	4,400 MGD
Volume treated (Ψ):	3,520 MG ¹⁶
Brine Waste Ψ:	880 MG
Time to treat:	1 day
Capital Cost:	\$880 Million

Alternatively, the dischargers could opt to construct a 5-MGD treatment plant and storage capacity for 158,000 acre-feet (volume passing Railroad Canyon weir during 1980 storms). This would limit the capital cost to treat an extreme wet weather event to \$10.5 million for the treatment plant, and between another \$35 million to \$182 million to purchase land area equivalent to two Lake Elsinores to store untreated water. This does not include the earthwork necessary to grade the land to store water to a depth of 25 feet. Further, it would take approximately four (4) years to treat that volume of water at 5 MGD.

The estimated cost of \$84.2 million is for treatment of one wet-weather storm, and reflects energy requirements and labor. Note that this estimate does not include costs for filtration processes prior to RO treatment – filtration of influent is necessary to reduce the amount of sediment and suspended solids in influent streams. It does not reflect the design, construction and maintenance of detention/storage facilities, delivery systems, effluent distribution systems and brine waste discharge system/program.

¹³ http://www.ocwd.com/_assets/_pdfs/OCWDWF21.pdf

¹⁴ Actual figure from mid-1970's.

¹⁵ Operating costs include energy requirement and labor; does not include advanced water treatment (lime clarification, recarbonation, multi-media filtration and chlorination).

¹⁶ Assuming 80% recovery in a treatment system similar to WF21.

The following table summarizes costs of two viable treatment technologies.

Technology	Capacity	Minimum Capital Cost
Constructed Wetlands	2394 MGD ¹⁷	\$ 16.2 Billion
Reverse Osmosis	4,400 MGD	\$ 0.9 Billion

Conclusion

There are no feasible stormwater treatment technologies available to treat the volume of stormwater runoff to Canyon Lake and/or Lake Elsinore to meet the proposed TMDL targets. Prior to establishment of final TMDL targets, we recommend that the Regional Board review the total cost of available technology capable of achieving the proposed TMDLs, as mandated by Section 304(b)(1)(B) of the Clean Water Act. The District would further recommend that at a minimum, the Regional Board revise the interim and final target to be consistent with achievable nutrient concentrations based on the limits of current technology.

¹⁷ 1 MGD = 1.55 cfs

NEED FOR ECONOMIC ANALYSIS

Neither the Federal Clean Water Act nor the California Water Code prohibits consideration of economic impact in issuing MS4 permits. On the contrary, it is incumbent upon all responsible public officials, whether elected or appointed, to consider the fiscal impacts of their decisions. The potential fiscal impacts of the proposed TMDL targets are real and significant, and should be fully identified and considered in the issuance of the TMDL.

The municipalities must be able to justify to their Boards and constituents that expenditures of public resources will result in real and significant benefits relative to completing societal needs. An economic analysis will further allow the municipalities to prepare budgets and funding requests for the management measures that will be necessary to improve the water quality of both lakes.

Los Angeles Trash TMDL Decision

The draft TMDL report specifically requires monitoring programs to be implemented. Further, the draft TMDL report proposes that the Regional Board adopt the TMDLs as an amendment to the Basin Plan. In the Statement of Decision for City of Arcadia *et al* v. The State Water Resources Control Board and The California Regional Water Quality Control Board, Los Angeles Region (2003), the Superior Court for the State of California, County of San Diego, ruled that the State and Regional Boards...

“Under the applicable statutory scheme Basin Plans (1) identify beneficial uses of water bodies to be protected; (2) establish water quality objectives to protect those uses; and (3) establish implementation programs for achieving the objectives.

As such, Respondents are incorrect in stating no water quality objectives are implemented. It may be true the Basin Plan was only amended to add the TMDL, but if the TMDL was originally part of the Basin Plan it necessarily would have made economic considerations under Section 13241. It is certainly reasonable to conclude that when amending the Basin Plan the same considerations should be made.¹⁸”

Thus, economic considerations must be analyzed under §13241 of the CWC in adopting a TMDL.

Federal Clean Water Act

Section 304 (b)(1)(B) of the Clean Water Act specifically states that in adopting or revising effluent limitations:

“[Such regulations] shall include consideration of the total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application, and shall also take into account the age of equipment and facilities involved,

¹⁸ Statement of Decision, The City of Arcadia, et al versus The State Water Resources Control Board and the California Regional Water Quality Control Board, Los Angeles Region. Filed December 24, 2003. Page 13, Lines 11-18.

the process employed, the engineering aspects of the application of various types of control techniques, process changes, non-water quality environmental impact (including energy requirements), and such other factors as the Administrator deems appropriate.”

Estimated costs for sample analysis and labor for water quality monitoring are summarized in the following table. These costs are estimated at \$344,000. Operation and maintenance of the stream flow gauges is an additional \$258,600.

Water Quality Monitoring Program	Estimated Cost
Analysis – Watershed & Lakes	
Labor – Watershed	\$172,068
Labor – Lakes	\$57,342
Total Annual Cost - Analysis & Labor	\$344,370
Gauge Station Annual O&M	\$258,600
Total Annual Cost	\$602,970
One-time Install of Remaining Gauges	\$126,000

It is imperative that economic considerations be analyzed in adopting the TMDL. We have prepared cost estimates for stormwater runoff treatment (previously discussed) and for water quality monitoring. As Attachment A demonstrates, preliminary cost estimates on current treatment technologies prove to be cost prohibitive and are not feasible in the arid weather patterns of the watershed. Sizing a treatment technology to accommodate and treat runoff to the proposed TMDL goals will be an inefficient use of taxpayer money; the proposed TMDL goals are extremely low and implementing treatment mechanisms to achieve those goals requires unrealistic BMP sizing.

IMPLEMENTATION SCHEDULE

Attachment A to the draft TMDL report includes an implementation schedule with several tasks. Each of these tasks requires the preparation of a separate plan and/or monitoring reports, often within a short period of time after the adoption of the proposed TMDL. The implementation schedule must be modified to reflect the following:

- 1) There are several BMP measures that have either recently been proposed or are in process including several in-lake nutrient control projects, New Development guidelines from the MS4 NPDES Permittees, and other discharger efforts that are expected to reduce nutrient loads within the watershed.
- 2) The Implementation Schedule does not allow sufficient time for dischargers in the watershed to develop collaborative processes, including establishment of agreements for cost sharing; generation of joint Requests for Proposals/Qualifications from consultants who may be able to assist with development of plans, implementation of monitoring programs and development of models specified in the TMDL; or to provide time for consultants and/or dischargers to thoughtfully prepare the requested plans and monitoring programs.
- 3) The implementation schedule, by requiring immediate compliance with the proposed TMDL interim numeric targets (over a 10 year running average) would require the dischargers to spend public resources on implementation of nutrient control measures that, based on the Draft Report, would not provide water quality benefits.

We request that the proposed implementation schedule be modified to take the following considerations into account:

- Compliance with TMDL targets should be delayed until further study of the applicability of the numeric targets can be completed. This period of study should be sufficient to allow for a wet year to occur. This would likely be no less than 5 years from adoption date.
- It will take time to form the necessary discharger work groups, identify funding sources to prepare plans and participate in such a coordinated effort. Further the FY 2004-05 budget planning cycle has passed. Plan submittal dates should be respective of fiscal cycles. Some cities may also require additional time for the bid process to hire consultants.
- The effectiveness of the nutrient management measures currently being implemented for both lakes and throughout the watershed requires evaluation. It will take at least a couple of years to identify their impact on water quality within the lakes. It could be that these measures are more effective than anticipated.
- The required continuation of the existing monitoring program and selection of the nutrient management plan may impact locations and parameters of additional monitoring; it is prudent that the monitoring program be considered as part of the nutrient management plan. Further, the deadline for submittal of the nutrient monitoring plan

should consider the fiscal budgeting cycle and the necessary time for the dischargers to form a functioning work group that can address the proposed monitoring plan.

- The TMDL models are not adequately calibrated for wet conditions. The proposed targets may significantly change if a large storm occurs. The TMDL compliance period and numeric modeling adoption should be delayed to allow a wet year to occur.

These recommendations are made in addition to those presented in the cover letter.

RECOMMENDATIONS

The District recommends the following be considered as changes to the TMDL:

1. The text on page 75 describing Tables 7-1 through 7-4 should make it clear that there are separate discharger nutrient allocations for Lake Elsinore and Canyon Lake.
2. The TMDL should include a framework under which pollutant trading may occur. Questions that the framework should answer include:
 - a. How long can credits be banked (recommend at least 10 years);
 - b. Who tracks and determines credits available (recommend the Regional Board);
 - c. What is the process by which pollutant trading occurs (recommend Regional Board establish policy); and
 - d. What is the pollutant trading value of activities such as dredging the lakes?

Alternatively, the Regional Board could require the dischargers to develop the aforementioned guidance as part of the Implementation Schedule.

3. The recommended interim and final numeric targets should be revised to be consistent with the irreducible concentration data presented earlier in this report. At a minimum, the in-lake concentration requirements should be raised to the same concentrations that the wastewater treatment plant operators are allowed to discharge (0.5 mg/L for Phosphorus, 1 mg/L for Nitrogen). Based on several of the conservative assumptions made in support of the TMDL, it may be possible to implement these changes without impairment of the Beneficial Uses.
4. Atmospheric deposition occurs throughout the watershed. The upstream dischargers do not have the ability to control the deposition in the watershed just as the lake owners cannot control the deposition onto the lake surfaces. There is not sufficient justification in the model to exempt atmospheric deposition onto the waterbodies and continue to require the dischargers in all other areas of the watershed to address atmospheric deposition in their WLA and LAs. We request that the total atmospheric deposition be calculated for the entire watershed, removed from the other land uses and include the load as a LA in the model.
5. Several important nutrient control projects shall be initiated within the next five years, including:
 - a. The MS4 Permittees' Water Quality Management Plan for new development
 - b. Implementation of new State mandated controls for septic systems
 - c. Additional in-lake nutrient control projects

As an alternative to the immediate implementation of the interim numeric targets, the first five years of the TMDL could be used to determine the impact of these activities on the beneficial uses in the lakes. The following additional activities could also be completed during the first five-year period:

- a. Form a Task Force to address the TMDL;
- b. Propose and implement land-use based nutrient control pilot projects;
- c. Revise and implement the in-lake and watershed-wide monitoring programs;
- d. Develop and revise the lake and watershed models; and
- e. Propose revised numeric targets for adoption by the Regional Board in 2009.

Allowing time to examine alternative nutrient control mechanisms, refine and update the models, and propose revised numeric targets will ensure that limited discharger resources are spent on activities that will effectively address the lake impairments. This will also allow the dischargers to assess the effectiveness of current nutrient management projects. Additional watershed controls to control external nutrient sources should only be implemented after in-lake controls have been successful in achieving their objectives.

6. The requirements of Task 5 are premature at this time:

- As of the current date, the State Water Resources Control Board has neither adopted nor even distributed the regulations required under California Water Code Sections 13290-13291.7. (AB 885 of 1999). AB 885 stipulated an effective date of January 1, 2004. The most recent draft distributed is over 1 year old, and systematic changes were described (...but not distributed) last December.
- The regulations indicated identify enforcement by the Regional Water Quality Control Boards, with a presumption that local agencies (i.e., the Department of Environmental Health) will assume responsibility through Memorandums of Understanding (MOUs). Given some of the more contentious elements within the regulations as discussed to date, and a probable significantly higher cost to the system owner, it is not a forgone conclusion that all local agencies will enter into such MOUs.
- Without said MOU it is not possible to implement Task 5.

The Riverside County Department of Environmental Health (DEH) has not been advised of the Regional Boards positions on entering into MOUs with the cities as well as the County.

It has come to the County's attention that at the April 19 TMDL meeting, testimony was given that the cities do not monitor/permit the septic systems within their cities, therefore the entire requirement may default to the County". Speaking to the Cities identified in Task 5, this statement implies that these activities are therefore conducted by the County. Both the statement and implication are incorrect and require clarification.

- City of Moreno Valley - The Riverside County DEH has a contract with the City of Moreno Valley to approve the design of septic systems. We do not issue the permit, we do not inspect the installation, we do not perform any “monitoring” of the systems and we do not investigate any system failures.
- City of Perris – The Riverside County DEH does not have a contract with the City of Perris related to septic systems. The County does not issue any permits, we do not inspect the installation, we do not perform any “monitoring” of the systems and we do not investigate any system failures.
- City of Murrieta – The Riverside County DEH has contracts with the City of Murrieta to approve the design of septic systems, inspect their installation and, upon request, investigate sewage discharges (which would include septic failures). The County does not issue the permit, nor does the County perform any “monitoring” of the systems.

The allocated timeframe of “6 months from the adoption of the effective date of this basin plan amendment” is inadequate. Due to the expected extensive changes to the current system, and related costs to the homeowners and businesses, the Board of Supervisors (and probably City legislators) will need to “approve in concept” the regulatory changes necessary for implementation. Our timetable is therefore: assimilate requirements, get on Board workshop schedule, have the workshop, and translate direction into a Plan.

Staff has been aware of the requirements of AB 885 since its introduction, and the requirements identified in Task 5 are not unexpected. However, the language of task 5, as written, require the County to: agree to enforce conditions without knowing what the conditions are, to entertain a MOU it may not want, and meet a schedule that is not realistic. Revised language for first paragraph:

No later than (*6 months from the effective date of this basin plan amendment*), 12 months from the effective date of an agreement between the County and the Santa Ana Regional Board to implement regulations adopted by the State Water Resources Control Board pursuant to California Water Code Sections 13290-13291.7, the County of Riverside and the Cities of Perris, Moreno Valley, and Murrieta.... ...The Septic System Management Plan shall implement regulations adopted by the State Water Resources Control Board pursuant to California Water Code Sections 13290-13291.7.

Allowing time to examine alternative nutrient control mechanisms, refine and update the models, and propose revised numeric targets will ensure that limited discharger resources are spent on activities that will effectively address the lake impairments. This will also allow the dischargers to assess the effectiveness of current nutrient management projects. Additional watershed controls to control external nutrient sources should only be implemented after in-lake controls have been successful in achieving their objectives.

7. Tasks 8 and 9 of Appendix A should be revised to only name the entities owning the lakes. This would be consistent with recent positions taken by EPA, the State, and other Regional

Boards that indicate that owners of facilities are responsible for the pollutants that they accept into their facilities.

8. Adequate Water Quality Funding: 40 CFR 130.2(p) defines *Reasonable assurance*.

“Reasonable assurance means a demonstration that TMDLs will be implemented through regulatory or voluntary actions, including management measures or other local controls, by federal, state, or local governments, authorized Tribes or individuals. Reasonable assurance for TMDLs established for nonpoint source pollution is addressed in 40 CFR 130.2(p)(2). 40 CFR 130.2(p)(2) requires a four-part test for nonpoint source pollution--the fourth part being that adequate water quality funding will support the TMDLs. 40 CFR 130.2(p)(2)(i) states in part, “Adequate water quality funding means that the State, Territory, or authorized Tribe has allocated existing water quality funds from any source to the implementation of the TMDL load allocations to the fullest extent practicable and in a manner consistent with the effective operation of its clean water program.”

Local governments were specifically and conspicuously excluded from 40 CFR 130.2(p)(2)(i); therefore all costs of implementing any task in the Basin Plan Amendment associated with nonpoint source pollution should be funded by the State as required by the Clean Water Act. The document and Attachment A to the Resolution should be modified accordingly to show State of California responsibilities.

**SPECIFIC COMMENTS:
LAKE ELSINORE AND CANYON LAKE NUTRIENT TMDL REPORT**

Pg. 6, 1st paragraph – Discussion should also include note that the lake occasionally goes dry, even before the levee was built.

Pg. 6, §2.2 – Discussion should acknowledge MSHCP will set aside vacant/open space land from being developed.

Pgs. 6, 7, and 8 – The cutoff channel around Mystic Lake carries little sediment because it has a low capacity. The bypass channel has not substantially changed the historic sediment inflow to Mystic Lake. Approximately every ten years on the average, there is enough rainfall in one year to produce flows in the San Jacinto River near Mystic Lake.

Pg. 17 Section 4.1.1 - During the reference state year of 2000-2001, Lake Elsinore had an average phosphorus concentration of .12 mg/L with no apparent algal blooms or fish kills and the lake was at an acceptable operational level. The use of the 25 percentile numeric target of 0.1 mg/L for the interim represents a direct 17% decrease in the waste load allocations for the watershed. While we recognize the need for a MOS, the 25% numeric target seems excessive.

Pg. 18, Table 4-2 – The Annual Average Total P should be reported in mg/L for direct comparison with the proposed numeric targets.

Pg. 20 – Is there conclusive data to back up the claim that the floodwaters of 1993 and 1995 “carried high nutrient loads from the San Jacinto watershed to Lake Elsinore”?

Pg. 23, §4.2.3 – As fish kills in Canyon Lake are based solely on anecdotal evidence, the first sentence should read: “Control of dissolved oxygen is important for Canyon Lake since the depletion of oxygen may have caused occasional fish kills, and has caused high nutrient flux rates....”

Pg. 47 – “...the LSPC model [developed by Tetra Tech] was never calibrated for the wet scenario”. In fact, the model had very poor hydrologic calibration with the rainfall vs. runoff for the observed data that year. Since the proposed TMDLs are sensitive to these wet year calibrations, the TMDL numeric target implementation should be delayed until the wet year condition model can be calibrated.

Pg. 50 – In Table 5-10b there appears to be an error in the moderate year section where the TN load from Canyon Lake sediment is included in the Lake Elsinore totals but not the TP load.

Pg. 61, Equation 3 – TP target should be changed to C_{ss} to be consistent with the text that follows.

Pg. 66, first full paragraph – The last sentence states that “no reduction in the internal load of phosphorus for Canyon Lake” will be assumed as lake management studies have not been conducted. In wet years, approximately 40% of the phosphorus mass load to Lake Elsinore comes from Canyon Lake. As elimination of all inputs to Canyon Lake would not lead to a reduction of total phosphorus in the lake, loads leaving Canyon Lake in a wet year could lead to Lake Elsinore TMDL load targets not being met. This is a concern if enforcement action results when Lake Elsinore target loads are exceeded.

Pg. 82, paragraph before §11.A. – The potentially affected parties will be asked to evaluate the TMDL-related costs. Any information the Regional Board already has should be provided.

Pgs. 86 – Several dischargers have provided economic information for nutrient treatment management measures and water quality monitoring. This information should be summarized in Section 11 (Economic Considerations) and Table 13-1 (Nutrient Management Projects table).

Pg. 87, Item C. – Local tax funds are listed as a source of public financing by the local agencies. In November 1996, California voters approved Proposition 218 (“The Right To Vote On Taxes Initiative”) amending Article XIII of the State Constitution¹⁹. Proposition 218 produced changes to some of the Permittees’ historic funding sources and still looms as a potential threat to others. Additionally, with the current budget crisis in California and Riverside County, local agencies are being required to make across-the-board cuts in public programs, including police and fire protection and higher education.

Attachment A, Page 2, Item 1., 2nd paragraph – Fish kills in Canyon Lake based solely on anecdotal evidence (Report, pg. 23). The sentence should indicate so.

Attachment A, Page 10, 1st paragraph – Flexibility should be allowed to move or remove stations that are not providing useful information for the TMDL model or that present a risk to personnel during sampling events. Both the listing of stations and their sampling frequency are located in Table 5-9t.

Attachment A, Page 17, Task 6 – The Santa Ana Drainage Area Management Plan (DAMP) is currently being developed in a phased manner according to the time schedules in Board Order R8-2002-0011. The DAMP is to be submitted to the Executive Officer no later than January 1, 2005. Attachment A, Pages 18 and 19, Tasks 8 and 9 – The tasks require a proposed plan and schedule to evaluate in-lake sediment nutrient reduction and treatment as well as a monitoring program. The purpose of the monitoring program is to evaluate the effectiveness of the strategy that is implemented, and as such, the location of monitoring stations will necessarily come after the strategy is adopted. Establishing monitoring stations just for collecting “data” will not be a judicious use of public funds.

Attachment A, Pages 19 and 20, Tasks 10 and 11 – Nowhere in the task descriptions does it say that the Regional Board will assist in procuring funding. Regional Board staff’s efforts to

¹⁹ The Proposition 218 amendments require voter approval of any new taxes, fees, assessments, etc. In addition, certain existing taxes and assessments were subject to the Initiative’s voter approval requirements. “Special taxes,” as defined by the Initiative, require a 2/3rds majority while other types of assessments may only require a simple majority. In addition, voter approval is required to raise any existing special tax or assessment rates.

procure state and federal grant funding was vital to the success of the initial TMDL monitoring efforts, and the Permittees hope that these efforts will continue.

Attachment A, Pages 19 and 20, Tasks 11 & 12 – The review/revision of the Lake Elsinore/Canyon Lake Nutrient TMDL would need to be accomplished prior to the review and revision of water quality objectives. It is recommended these two tasks be switched so that Task 11 is the review/revision of nutrient TMDL and Task 12 is the review/revision of the water quality objectives.

Attachment B, Items I (Aesthetics) and IV (Biological Resources) – BMPs or treatment measures constructed to meet the interim and final TMDL targets could be aesthetically unpleasing due to large land requirements. Such lands may include those currently supporting riparian habitat or sensitive species. This needs to be acknowledged in the Environmental Checklist.



Elsinore Valley Municipal Water District

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June 3, 2004

California Regional Water Quality Control Board
Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501-3348

Attention: Xinyu (Cindy) Li, Ph.D.

Dear Ms. Li:

We appreciate the opportunity to comment on the TMDL draft reports of March 26, 2004 and revised May 21, 2004. Elsinore Valley Municipal Water District has reviewed the report with expert input from Dr. Alex Horne, Ph.D. Professor Emeritus UC Berkeley. This review points to a number of issues that are not addressed in the traditional approach used in this study. In fact because of Lake Elsinore's unique status, we believe the traditional approach does not adequately portray the necessary requirements or the physical conditions needing to be addressed to establish TMDL.

Lake Elsinore is unique because it is and always will be a eutrophic lake. Lake Elsinore is unique because it is an ephemeral lake subject to extreme fluctuation in water supply as experienced in the desert climate of southern California. Because this is a eutrophic ephemeral lake, it is subject to an extreme variation in loading, whether it be from external derived nutrients or internal loading from thousands of years of watershed settlement deposition. This large variance can not be controlled by traditional best practices or treatment technologies; and, therefore, requires a different analysis which is outlined in our expert review. The District requests that the Regional Board continue its TMDL hearings and not schedule any action until our expert analysis is fully reviewed and presented.

The TMDL should include a more realistic appraisal of the lake's potential for beneficial use such as the overriding need for a stable water level to reduce fish kills and algae blooms. The TMDL process is designed to restore polluted lakes to their original state by reducing nutrient inputs to levels that restore historical water quality or at least some level above historical. The draft document recognizes that the TMDL process has difficulty in trying to reverse eutrophication in Lake Elsinore since it is a shallow naturally eutrophic lake with a large watershed. Unlike most lakes, the role of nutrients and thus TMDLs in Lake Elsinore are subordinate to lake level or the climate. Because of their minimal impact, it is unlikely that the TMDLs as proposed will bring any

noticeable increase in beneficial use. However, the lake can be improved without the traditional imposition of more restrictive TMDL values.

Other than a stable lake level target, the only other target needed is that the dissolved oxygen (DO) standard should be raised to 5 mg/L throughout the water column. High bottom water DO is needed to attain the already agreed upon N and P offsets for import of reclaimed water. High benthic DO is also needed to reduce fish kills and reduce the release of toxic ammonia. The N, P and chlorophyll-a standards are unrealistically low for a lake with such a high ratio of watershed to lake surface area. The current numerical TMDL targets for Lake Elsinore do not provide acceptable water clarity or protection from fish kills or algal blooms. A higher standard for DO throughout the water column seems to be all that is required to protect beneficial uses at present. The method by which the DO is attained is perhaps best left to others than the Regional Board in the same way that the BOD in wastewater effluent is set by the board but the method of achievement is left to the treatment plant owners.

The lake model seems to indicate that an increase of water level will be more beneficial than implementation of watershed TMDLs and conversely, that a reduction in water levels will overwhelm any benefits from TMDLs. The issue of a stable and high lake level, which exceeds water quality in importance, is not addressed adequately in the beneficial use impairment sections. Admittedly, lake level versus water quality has not been a part of most TMDL considerations but Lake Elsinore is unique in this respect and the improvement in beneficial uses can be achieved by other methods, primarily by lake management. (The potential methods were given in the 2002 EVMWD NPDES feasibility study).

Good water clarity (>2 m Secchi depth) is only achievable with biomanipulation that requires a relatively stable water level. The draft TMDL document will provide only ~ 0.5 to 1 m Secchi depth even if the TMDL targets are reached. A Secchi depth of 0.5 to 1 m is not an acceptable value for public water contact recreation. Finally the controversial lake level versus fish kill relationship (or lack of same) should be addressed in a more balanced way.

Elsinore Valley Municipal Water District makes the following technical recommendations:

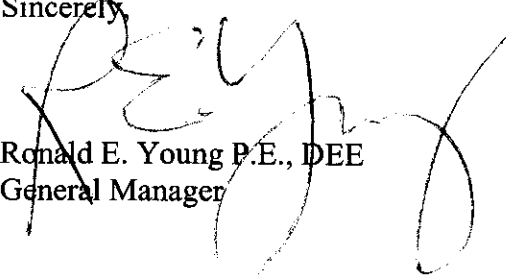
1. The minimum dissolved oxygen target of 5mg/L be set for all water depths.
2. A target water level of 1246 +/- 1.0 ft msl be set as a long-term numerical TMDL target. This corresponds to a limnologically more meaningful 26 feet maximum water depth.
3. Biomanipulation and long-term in-lake TMDL management targets (methods) be set in place of numerical N,P, chlorophyll or Secchi target (concentrations).

4. No target for in-lake nutrients (nitrogen and phosphorus) be set with exception of the Health Department rule of less than 10 mg/L as N for Canyon Lake (for drinking water source protection).
5. Nitrogen be defined as biologically available Total Inorganic Nitrogen (TIN) not Total Nitrogen (TIN + biologically unavailable organic-N) in lake targets and lake models.
6. Phosphorus be defined as either 80% Total Phosphorus (TP) or biologically available TP (most forms of P except apatite, calcium phosphate).
7. The lake level versus fish kill section be reconsidered in the light of the lake model now available and with consideration of other opinions.

In summary, we are very interested in a balanced TMDL that has a reasonable level of success built in. There is substantial doubt that the traditional end-of-pipe concentration standards being proposed for nitrogen and phosphorus can achieve that success. These traditional solutions require an enormous commitment of capital funds that are not available in the foreseeable future despite the efforts of LESJWA to proceed with Prop 13 funding and other approaches. Setting a standard which guarantees noncompliance and does not improve the beneficial use of Lake Elsinore for fishing and recreational activities would be counterproductive.

Please contact the undersigned to schedule a meeting at our mutual convenience for a more detailed explanation.

Sincerely,



Ronald E. Young P.E., DEE
General Manager

DRAFT – DRAFT - DRAFT

Memo to: Phil Miller, Elsinore Valley Municipal Water District (EVMWD)

From: Alex Horne, Ph. D. Professor Emeritus UC Berkeley and lake consultant to EVMWD

Re: Review of the California Regional Board Water Quality Control Board (Santa Ana Region): Lake Elsinore & Canyon Lake Nutrient Total Maximum Daily Loads dated 26 March 2004 prepared by Xinyu “Cindy” Li Ph. D.

Date: 24 May 2004

SUMMARY

The Draft TMDL proposal has some excellent points and attempts to solve a difficult situation in morphometrically eutrophic Lake Elsinore. However, several factors about the current lake are unique and artificial causing the management for maximum public benefit to conflict with some recommendations made in the TMDL. The draft TMDL could be improved in several ways. These primarily include a more realistic appraisal of the lake's potential for beneficial uses, recognition of the overriding need for a stable water level and reduction in fish kills and malodor. The TMDL process is designed to restore polluted lakes to their original state by reducing nutrient inputs to levels that restore historical water quality or at least some level above historical that is tolerable. The draft TMDL recognizes that the TMDL process has difficulty in trying to reverse eutrophication in Lake Elsinore since it is a shallow naturally eutrophic lake with a large watershed. Unlike most lakes, the role of nutrients (and thus TMDLs) in Lake Elsinore are subordinate to lake level or the climate. Because of their minimal impact, it is unlikely that the TMDLs as proposed will bring any noticeable reduction in beneficial use. However, the lake can be improved, just not in the tradition way of imposing more restrictive TMDL values.

Of the targets needed other than a stable lake level the only one needed is that the dissolved oxygen (DO). The DO standard should be raised to 5 mg/L throughout the water column, not just at the top. High bottom water DO is needed to attain the already agreed upon N and P offsets for import of reclaimed water. High benthic DO is also needed to prevent fish kills and the release of toxic ammonia. The N, P and chlorophyll *a* standards are unrealistically low for a lake with such a high ratio of watershed: lake surface area, especially since the lake has been deliberately reduced in size by 50%. These three targets are not helpful. The current numerical TMDL targets for Lake Elsinore do not provide acceptable water clarity or protection from fish kills or malodor. More stringent TMDL targets are simply not attainable. A standard for DO throughout the water column seems to be all that is required to protect beneficial uses at present. The method by which the DO is attained in perhaps best left to others than the Regional Board in the same way that the BOD in wastewater effluent is set by the board but the method of achievement is left to the treatment plant owners. The lake model indicates that an increase of water level will do more than any watershed TMDLs and conversely that a reduction in water levels will overwhelm any TMDLs. In numerical targets are set for

N, the use of the TN as a numerical target should be avoided since TN in Lake Elsinore is dominated by biologically inert organic-N. The use of biologically available TIN (Total Inorganic Nitrogen = ammonia + nitrate) is suggested to replace TN. The use of TIN would change the T:P ratios and potential BMPs in the watershed.

The issue of a stable and high lake level, which exceeds water quality in importance, is not addressed adequately in the beneficial use impairment sections. Admittedly, lake level versus water quality has not been a part of most TMDL considerations but Lake Elsinore is unique in this respect. However, the existing beneficial uses can be achieved by other methods, primarily by lake management. The potential methods were given in the 2002 EVMWD NPDES permit application. Most importantly, good water clarity (> 2 m Secchi depth) is only achievable with biomanipulation that requires a relatively stable water level. The draft TMDL document will provide only ~ 0.5 to 1 m Secchi depth even if the TMDL targets are reached. A Secchi depth of 0.5 to 1 m is not an acceptable value for public water contact recreation. Finally, the controversial lake level versus fish kill relationship (or lack of same) should be addressed in a more balanced way.

RECOMMENDATIONS (in order of priority)

1. The minimum dissolved oxygen target of 5 mg/L be set for all water depths
2. A target water level of 1246 \pm 1.0 ft amsl be set as a long-term numerical TMDL target. This corresponds to a limnologically more meaningful 26 feet maximum water depth.
3. Biomanipulation and long-term in-lake TMDL management targets (methods) be set in place of numerical N, P, chlorophyll or Secchi targets (concentrations).
4. No target for in-lake nutrients (nitrogen and phosphorus) be set with the exception of the Health Department rule of less than 10 mg/L as N for Canyon Lake (for drinking water source protection).
5. Nitrogen be defined as biologically available Total Inorganic Nitrogen (TIN) not Total Nitrogen (TIN + biologically unavailable organic-N) in lake targets and lake models.
6. Phosphorus be defined as either 80% Total Phosphorus (TP) or biologically available TP (most forms of P except apatite, calcium phosphate).
7. The lake level versus fish kill section be reconsidered in the light of the lake model now available and with consideration of other opinions.

REVIEW OF THE DRAFT TMDL

OVERALL

The problems of Lake Elsinore include both conventional and rather unique elements. In addition, the lake has not been well studied over many years in the way that many other lakes have been examined. Thus the TMDL has to extrapolate in some areas and make suggestions based on little data in others. These limitations are admitted in the draft TMDL. Although the extrapolations are often correct, in some areas they are

questionable. This review discussed some of the questionable extrapolations and suggests alternatives.

Lack of lake water elevation (minimum water depth) and small variation in water depth as prime targets for the TMDLs

It has not been customary for TMDLs to consider water depth as a prime numerical target. This is because most lakes have a small variation in depth over the season and over decades. Lake Elsinore is an outlier in this respect and naturally dried out every generation or so. The draft TMDL shows that in-lake nutrient concentrations vary dramatically as the lake level rises and falls with the natural drought cycles of the semi-arid southwest USA. Even with almost no inflow (ideal zero daily loads) the water quality falls. Thus the traditional TMDLs in the watershed play a small role in the beneficial uses of the lake.

The draft TMDL report should be recast to consider the reality of the role of water level in the lake. While no one wants large amounts of nutrients to be delivered to Lake Elsinore, there is no good way to provide beneficial use attainment without a higher and stable water level. Thus conventional TMDLs are simply not appropriate at this stage. When the lake water level is stabilized at say the agreed upon "desirable depth of 25 feet (1246 +/- 1.0 ft aml) the water quality will improve so much that the current TMDL targets will either be met automatically or can be set in a meaningful way.

Thus the long-term TMDL targets should be focused on reaching the desirable water level and maintaining very small seasonal water elevation variations. Once this occurs biomanipulation will occur with or without any help from TMDLs and lake clarity will improve, algae decline and the in-lake TMDL targets may indeed be reached or exceeded. Without a stable water level the TMDL targets will probably never be reached in a consistent fashion. The current numerical targets for Lake Elsinore do not provide any really acceptable water clarity or protection from fish kills or malodor.

NUMERIC TARGETS: ALTERNATE SUGGESTIONS TO THE AMOUNTS AND DEFINITIONS USED IN THE TMDL

Dissolved oxygen.

The target DO for the deeper water in Lake Elsinore and Canyon Lake (table 401 in the draft report) is too low to achieve beneficial uses. It is set at 2 mg/L for a depth of 1 meter from the sediments. This target is not protective of the beneficial uses for two reasons.

- Bottom water DO of 2 mg/L fails to provide sufficient oxidizing power to ensure that the N and P will not be released from the sediments. Typically a DO of 2 mg/L one meter from the sediments means that the sediments themselves will be anoxic and release phosphate and toxic ammonia. The releases called internal loading in eutrophic lakes usually exceed the external loadings. Unless internal

loading is reduced to as low a level as possible the efforts to control external loading using the TMDL process will be compromised. Research in Lake Elsinore has shown that high levels of DO (5-10 mg/L) are needed to fully suppress the release of soluble phosphate and ammonia (Beutel, 2000). This work confirms existing practices in lake management.

- The most important beneficial use impairment in Lake Elsinore is lack of water. Supplementation with reclaimed make up water containing some nutrients now occurs but was predicated on a 1:1 swap of nutrient suppression in the sediments for nutrients added in the reclaimed water. The amounts were agreed at a meeting of all parties (City of Lake Elsinore, Professors Anderson and Horne). Nutrient suppression in the sediments requires a DO of at least 5 mg/L in water measured 1 meter above the lake bed.

A numeric target of 5 mg/L is suggested for both deep and shallow surface waters of both Lake Elsinore and Canyon Lake.

Numeric targets for nitrogen and phosphorus

The proposed targets in the draft TMDL for phosphorus are 100 ug/L (2009) and 50 ug/L (2019) both measured at total phosphorus (TP). The equivalent standards for nitrogen at 1,000 ug/L (2009) and 500 ug/L (2019) measured as total nitrogen (TN). The TP target is predicated on a supposed phosphorus limitation for algae growth in the lake and the TP standard is based on a 1:10 ratio of P:N.

The use of TN and not TIN to derive a N:P ratio inevitably biases the ratio to show phosphorus limitation. A more rational ratio of TIN: 80% TP should be used to determine if there is a relative shortage of P or N. Such a difference is not academic. The reduction of N or P from the watershed requires very different emphasis and technologies. Reduction of N or P in the lake may also require different methods. In addition the reduction of N and P is best done in parallel with TIN and TP being kept at a constant 10:1 ratio. Use of TN to TP will obscure the balance in the desired ratio and provoke increased growths of possibly toxic blue-green algae (cyanobacteria).

Algal growth in Lake Elsinore is limited by light and CO₂, not nitrogen or phosphorus as stated in the draft TMDL.

Light limitation. At present it is unlikely that the lake is limited by any “conventional” nutrient such as nitrogen or phosphorus. Thus TMDL targets based on N or P concentrations are one step away from reality. Light is probably the most limiting factor for most of the day and carbon dioxide likely limits growth in the afternoon when pH rises due to depletion of CO₂. The recent summer chlorophyll *a* concentration of > 300 mg/m² (>300 ug/L (2000-02, see Draft TMDL appendices) exceeds the theoretical aerial maximum chlorophyll *a* value of 250 mg/m² even if the lake was only 3 feet deep. The high chlorophyll in the upper water uses up all the biologically usable light and thus the

deeper algae are effectively in the dark and cannot photosynthesize. When the wind blows surface algae are mixed down and deeper ones mixed up so, unlike flowers shaded by trees, they do not die. However, overall growth, productivity and potential oxygen demand in the sediments and in the water at night are still limited by available light, not nutrients.

Thus with the current average depth of about 12 feet (3.5 m) there is far more algal pigment than can be efficiently used. The current value is approximately $1,000 \text{ mg/m}^2$ or four times the theoretical maximum. Even if the chlorophyll falls to levels found earlier at higher water levels (100-150 ug/L) the same high aerial value will occur since the lower pigment will be spread over a deeper water column. At these higher water levels (~ 25 feet or 7.5 m) the lower chlorophyll per volume still integrates into over 900 mg/m^2 , almost identical to the current aerial values at lower water levels. At some deeper depth the mixing of deeper water will be small (see Anderson's Appendix in the draft TMDL) and chlorophyll values will fall in deep water so that the integrated column number falls. However, the decline will still put the aerial value well above the maximum and thus light will still limit algae growth in Lake Elsinore over all contemplated water depths.

Carbon dioxide limitation. At or even much below chlorophyll *a* levels of 100-300 ug/L ($900 - 1,000 \text{ mg/m}^2$) the amount of dissolved carbon dioxide is not able to keep pace with maximum photosynthesis. Carbon dioxide will dissolve back into the lake each night so next morning algal growth can resume but this still means that the daily production rate is limited by light and carbon dioxide.

Given the rate of internal loading of both N and P and current concentrations of the soluble bioavailable forms of these two elements it is doubtful if the target concentrations can be reached or, if reached will attain the decline in algae required to meet beneficial uses. For most lakes a minimum water transparency of 2 m (~ 6.5 feet) measured as Secchi disc depth is required. At this water clarity lifeguards could see the body of a drowning swimmer in much of the shoreline water. The current predictions of water transparency are in the range of 0.4 to 1 m (1.3 to 3.3 feet). The beneficial use improvement of water clarity increases of 1 to 3 feet are not obvious for a lake with many public beaches and good use potential.

Recommendation. Based on the above discussion it is recommended that the current policy with no fixed standards for the lake in terms of phosphorus and nitrogen be continued. Tightening the dissolved oxygen standard (see below) will provide a better protection of beneficial uses than the indirect N or P standards.

Increased dissolved oxygen standard

A standard for DO throughout the water column seems to be all that is required to protect beneficial uses at present. The method by which the DO is attained is perhaps best left to others than the Regional Board in the same way that the BOD in wastewater effluent is set by the board but the method of achievement is left to the treatment plant owners. The

climate seems to make a mockery of attempts to control the lake nutrient values. However, an increase in imported water to maintain the lake at a much higher level, regardless of the water source or nutrient levels (within reason) seems the optimum way to improved lake beneficial uses. It is noted that the water quality model developed by Professor Anderson shows a continual improvement in water quality as the lake depth increases (see Appendix B of the draft TMDL).

It is likely that fish kills in Lake Elsinore are due to low DO, in particular short nocturnal episodes in calm conditions followed by mixing. The force for mixing could either be wind or convection currents. Oxygen runs out in bottom waters when mixing of oxygen-rich water ceases or is slowed so that the demand for oxygen in the sediments exceeds the supply provided by vertical mixing. For almost any inflow of nutrients into this particular lake, there will be a high sediment oxygen demand (SOD). In turn SOD is Warm water fish in Lake Elsinore can escape low bottom water DO by moving to the surface. However, when the lake turns over with little bottom DO the entire water column can fall below 1.5 mg/L DO and large fish kills occur within minutes.

Adjusting the definition of N and P to reflect their use by nuisance algae

Nitrogen definition. The use of TN is not appropriate for lake water quality targets or models and will blur any efforts to determine cause and effects. Total-N includes the two main bioavailable forms of nitrogen (nitrate and ammonia + total inorganic nitrogen or TIN) but also the biologically unavailable form of dissolved and particulate N. For algae control it is the TIN that is important. The current approach uses TIN and its continuation is recommended. If TN is used instead of TIN the target will be meaningless since it is quite possible that the standard could be met but algae blooms would continue and vice versa. In Lake Elsinore the difference between TIN and TN is critical since most of the TN is organic nitrogen and very little is bioavailable TIN (draft report, Chapter 4, Table 4-2, footnote #7). If TIN were used instead of TN is it probably that the lake would become strongly N-limited (as is typical of eutrophic lakes) and that attempts to reduce bioavailable N and P in a 10:1 ratio would change the nature of the BMPs in the watershed if TMDLs were set based on the lake targets of N and P. For example, constructed wetlands in the watershed are an excellent and inexpensive way to reduce nitrate (e.g. Santa Ana River or San Diego Creek) while it is much more difficult to reduce phosphate or TP with such wetlands (e.g. Florida Everglades protection wetlands project). Conversely, it is relatively easy to reduce TP loading with detention ponds in the watershed but hard to remove nitrate with such devices.

Phosphorus definition. In contrast TP is a usable standard so long as the TP does not contain much unavailable P (usually apatite, calcium phosphate). The target should be amended to biologically available TP. The internal loading from the sediments is always soluble and biologically available phosphate and is thus covered by the TP designation. However, external loading may be mostly apatite washed in from erosion of the surrounding hills and creek banks. Tests are needed over several storms to assess the percentage of inflowing TP that is biologically available.

Difficulty of setting TMDL targets in Lake Elsinore.

The levels of nutrients specified as target amounts are probably too low for realistic implementation in a lake with such a high ratio of lake surface to drainage. Lake Elsinore has a ratio of 167 (3,000 to approximately 500,000 acres) and lakes with ratios over 1: 40 are generally eutrophic. Certainly ratios in excess of 1:100 are almost certainly eutrophic. Note that the management of the lake that reduced that lake surface area by 50% also increased the likelihood of eutrophication.

The ratio of watershed to lake area can be combined with the depth of the lake (> 30 feet) to indicate morphometrically eutrophication. Lakes with water depth less than 30 feet are normally polymictic that is the water is mixed top-to-bottom every few days or weeks even in summer. The draft TMDL notes such a condition in Lake Elsinore and it is part of the model in Appendix 2. Given the large drainage basin nutrients flow into the lake in large amounts. Given the shallow depth and polymixis, the nutrients grow algae in large amounts. Only by diverting the light or the nutrients into less nuisance forms can the beneficial uses of Lake Elsinore be achieved. It is likely impossible to reduce the nutrients sufficiently in the watershed to achieve the beneficial uses set by the board. The beneficial uses are unnatural and can only be achieved by other means than classical TMDLs.

However, the existing beneficial uses can be achieved by other methods, primarily by lake management. The potential methods were given in the February 2002 EVMWD NPDES Permit document (Montgomery Watson Harza, Pasadena Office). Most importantly good water clarity (> 2 m Secchi depth) is only achievable with biomanipulation that requires a relatively stable water level. The draft TMDL document will provide only ~ 0.5 to 1 m Secchi depth even if the TMDL targets are reached. A Secchi depth of 0.5 to 1 m is not an acceptable value for public water contact recreation.

Fish kills not clearly related to water depth in partial contraction to the draft TMDL

Fish kills are the second most important factor in the beneficial use impairment in Lake Elsinore after water level maintenance and prevention of the lake drying out. The draft TMDL correctly states that the fish kills are primarily due to low dissolved oxygen (DO) levels in the lake. However, the statement in the TMDL that "...it appears that fish kills coincide with either very shallow lake levels or high flows from the watershed due to heavy rainfall events." However, the evidence provided (Table 3-1) does not fully reflect the most pertinent data and is open to alternative interpretations. Such an alternative is presented below. In particular it should be noted that although the draft EIR is correct in the statement quoted earlier "...it appears that fish kills coincide with either very shallow lake levels or high flows from the watershed due to heavy rainfall events" is only part of the story. It is also true that low lake levels that "caused" fish kills often did not result in large fish kills even in adjacent years. Other factors seem to play the more important role and such factors include nocturnal convection. The distinction is

important since different cures are needed for low water; nocturnal convection or other possible causes of the fish kills in the lake.

Data for the most recent years 1991-98 when the lake was in its current much reduced form but still with a full range of water depth is shown in Table 1. This table shows no good relationship between water levels and fish kills in Lake Elsinore. Data for earlier years (Appendix Table A-1) supports this finding in general. Fish kills occurred at high, low and intermediate water levels. Large fish kills did occur at very low water levels in the 1986-92 drought but similar low lake levels, often in adjacent years, did not result in large fish kills. High lake levels resulting from recent high inflows were also not reliable predictors of fish deaths, in contradiction of the statements in the draft TMDL. Between 1982 and 2002, in water less than 17 feet, major fish kills occurred only 20% of the time. In water greater than this depth (18-33 feet) major fish kills occurred 14% of the time. If the very shallow waters of the 1987-92 drought are excluded, fish kills of some kind occurred in 38% of years, all of these being in water over 17 feet deep. Thus the evidence tends to suggest that shallow water is not a critical item in fish kills in the lake. Of course if the water became very shallow, a few feet, the fish may run out of food or be crowded into such a small area that fish kills would occur. However, this has not been the case for the past few decades.

Table 1. Lake Elsinore: Surface elevation, water depth, dissolved oxygen and reported fish kills 1991-98.

Year	Max. depth (ft)	Fish kill estimate	Lake level
1991	8	Large	Very low
1992	7	Small	Very low
1993	33	Large	Very high
1995	32	Small	Very high
1996	27	Small	Desirable*
1997	23	Small	Desirable
1998	29	Medium	High

* Desirable is an agreed range of water depths.

Overall, the lake levels in Lake Elsinore, California do not seem to have had a predictable effect on fish kills. Even at very low water levels (< ~1233 feet or maximum depth < 10 feet), large fish kills occurred only 2 out of the 4 recent years of record. Since the early years of the 1989-92 drought did not produce large fish kills, the deaths cannot be due to the simple squeezing together of large numbers of fish as the lake diminished in volume. Therefore another mechanism must operate along with the low water levels in order to result in large fish kills (see Table 2). In this table lake volume is used as an alternative to lake level and the amount of algae present (surrogate for simple oxygen depletion or excess eutrophication) is shown. It can be seen that fish kills were primarily due to some other factor than lake volume (lake level) or algae blooms (oxygen demand). Thus there is not clear relationship between algae blooms and fish kills. The lack of relationship is critical since the TMDL which attempts to control algae blooms via nutrient reductions. The evidence presented here is that such a control will be erratic and tentative and

APPENDIX A. LAKE ELSINORE: FISH KILLS AND WATER DEPTH

Table A-1. Lake Elsinore: Surface elevation, water depth, dissolved oxygen and reported fish kills for 1982-2000. Equal attention to fish kills was probably not given to all years, especially higher water years 1982-87. However, the medium and large kills noted in the period 1991-98 would probably have reported. Data from Montgomery-Watson, 1997, Santa Ana Regional Water Quality Control Board, 2000, Riverside County Flood Control & Water Conservation District, 2001

Year	August Lake elevation ft	Max depth ft	Max depth m	DO < 1 mg/L at bottom	Fish kill M-W	Fish Kill RWQC B	Gen lake level	Mean depth, ft
1982	1251	28				No report	High	
1983	1260	37				No report	Very high	
1984	1252	29				No report	High	
1985	1248	25				No report	Desirable	
1986	1245	22				No report	Desirable	
1987	1241	18				No report	Desirable	
1988	1237	14				No report	Low	
1989	1233	10				No report	Low	
1990	1231	8		July-Aug	July-Aug	No report	Very low	
1991	1231	8		Mar-Apr, Oct	No	Large	Very low	
1992	1230	7		Aug	July-Aug	Small	Very low	
1993	1256	33		Aug?*	No	Large	Very high	
1994	1252	29		Sept	No	No report	High	
1995	1255	32		Aug	June-July	Small	Very high	25
1996	1250	27				Small	Desirable	
1997	1246	23				Small	Desirable	
1998	1252	29				Medium	High	
1999	1247	24				No report	Desirable	
2000	1243	20				No report	Desirable	
2001	1239	17				-	Desirable	

* No data reported for mid-summer, but DO 2 mg/L in July as in previous years when DO < 1 mg/L in August.

perhaps fish kills could more efficiently be reduced by other methods than TMDL implementation. However, there may be other reasons for the TMDL than fish kill reductions.

Table 2. Some statistics on oxygen conditions, oxygen demand and volume as related to fish kills for Lake Elsinore in the period 1990-96. Data from Montgomery-Watson (1997).

Date	Initial DO mg/L	Final DO mg/L	Duration of low DO days	Oxygen demand mg/L/d	Approx. lake volume (10^6 m^3)	Mass based oxygen demand tons/day	Fish kill
July-Aug 90	6	0	60	0.10	35	3.4	X
March 91	7	0	30	0.23	35	8.1	
July-Aug 91	9	0	100	0.09	35	3.2	
Feb 1992	14	9	30	0.17	100	17	
March 92	9	6	30	0.10	100	10	
July-Aug 92	6.5	2	60	0.08	100	8	X
Mar-April 92	16	8	45	0.18	100	18	
Jun-Aug 94	8.5	2.5	90	0.07	100	17	
May 95	14.5	6	30	0.28	110	31	
June-July 95	9	3	90	0.07	110	7.3	X
June 96	10	5.5	30	0.15	92	14	

DEPARTMENT OF TRANSPORTATION

DISTRICT 8

DESIGN (MS 1164)

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*Flex your power!
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June 4, 2004

Xinyu (Cindy) Li
Santa Ana Regional Water Quality Control Board
3737 Main Street Suite 500
Riverside, CA 92501-3348

Dear Ms. Li

We appreciate the opportunity to comment on the Technical TMDL Report for nutrients for Lake Elsinore and Canyon Lake in the San Jacinto watershed. The Department strongly supports the efforts to protect the environment and achieve the best possible water quality possible. However, the Department does have concerns about portions of the report. Our main concern is this TMDL would require the construction of treatment controls, not yet developed, however the benefits has not been demonstrated to justify the cost.

The Department notes that the first documented case of a fish kill in Lake Elsinore occurred in 1933, and they may have occurred previously. In addition, algal blooms have been noted since the early 20th century. This was long before urban runoff was a significant contributor to the phosphorus inputs to this system. The 1933 fish kill occurred shortly after completion of the dam that formed Canyon Lake. The creation of Canyon Lake and diversion of water from the San Jacinto River into Mystic Lake have severely reduced the freshwater inflows to this system and have undoubtedly contributed to the current conditions. The data presented in the TMDL also indicate that many of the fish kills have occurred when the lake elevation was low.

As stated in the report the source analysis demonstrates that during the summertime, the predominant source of nutrients causing eutrophication is the internal loading from sediments. This sediment has been present in the lake since historical times and could not have been substantially derived from urban or highway runoff.

This long historical record of algal blooms and fish kills indicates that Lake Elsinore may be naturally eutrophic and that urban and highway runoff may not have contributed to any substantial change in the water quality of the lake. The historical record also indicates that the WARM designated use has not been maintained continuously (the lake being dry for almost 10 years in the 1950's and 1960's) and may not be achievable at all times in the future even with efforts on the part of dischargers to reduce their contribution of nutrients to the lake.

The Department is concerned to see that an allowable phosphorus concentration of 0.5 mg/L will be allowed in recycled water that will be used to maintain the elevation of Lake Elsinore. The proposed TMDL indicates that stormwater runoff must ultimately have a concentration of less than 0.05 mg/L.

The concentration in urban runoff would be one tenth that allowed in recycled water, which is produced in an advanced treatment plant operated and manned continuously. It is unreasonable to expect that currently available technology used for stormwater treatment on an intermittent basis and without operators could possibly achieve this level of performance. The average phosphorus concentration from highway runoff is 0.28 mg/L. There is currently no conventional treatment BMP that can reduce phosphorus to the proposed concentration of 0.05 mg/L. Advanced treatment would need to be considered at a great cost. This TMDL has not demonstrated the benefit would justify the cost.

The report proposes a numeric target for Total Phosphorus of 0.1 mg/l to be attained by 2015 and 0.05 mg/l to be attained by 2020 for both Canyon Lake and Lake Elsinore. The report proposes a numeric target for Total Nitrogen of 1 mg/L to be attained by 2015 and 0.5 mg/L to be attained by 2020 for both Canyon Lake and Lake Elsinore. The total inorganic nitrogen target is substantially lower than the target currently in the Basin Plan, 8 mg/L for Canyon Lake and 1.5 mg/L for Lake Elsinore.

The Department also notes that there is little it can do with regard to source controls. Our construction projects often require soil stabilization (erosion control) measures, which include the use of fertilizers (typically compost). Eliminating or reducing these fertilizers would, however, increase the probability of erosion due to inadequate vegetative cover. In so doing, there would then be an increase in the risk of discharging soil-borne nutrients (not to mention the other detriments of sediment discharge).

We are concerned that there is a need to examine the cumulative cost and technical implications of this TMDL combined with possible future TMDLs in the Region. The problem we see is that while some initial TMDLs may be fundable, the full set of TMDLs may be far beyond available resources. Our related concern is that controls implemented for the initial TMDLs may not be compatible with subsequent TMDLs. For example, the available data indicates that urban runoff typically exceeds standards for a number of constituents including trash, sediment, and metals. The initial TMDL is for nutrients, if it is determined that waterways are impaired by other substances, then additional TMDLs will be prepared. It is possible that the controls required for later TMDLs may not be compatible with the controls implemented for the initial TMDLs. Clearly, what is needed is a watershed approach that examines and prioritizes the overall water quality needs and assesses the financial feasibility of achieving these goals.

The Department is willing to partner with municipalities or other agencies on a pro rata basis to implement measures that are technically feasible and justifiable economically. The Department owns and maintains approximately 132.4 miles of roadway and three maintenance stations in the San Jacinto watershed. The total area of this right-of-way is approximately 2,400 acres, which is approximately 0.5% of the watershed.

Ms. Li
June 4, 2004
Page 3

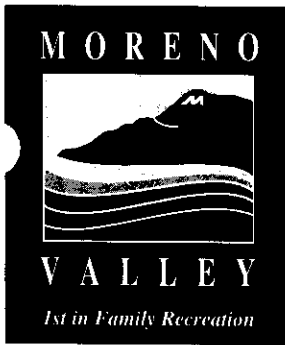
However, it should be noted that Department facilities within the watershed is not a major source of nutrients contributing to impairment to the lakes. Limiting uses of chemicals for agricultural practices within the watershed may be more effective in improvements to the lakes.

We hope these comments are helpful. If you have any questions, please call me at (909) 383-4948.

Sincerely,

A handwritten signature in cursive script, appearing to read "Paul Lambert".

PAUL LAMBERT
District 8 NPDES Storm Water Coordinator



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HAS 6/4/04

2004 JUN -4 8:08

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June 4, 2004

Gerald J. Thibeault, Executive Director
California Regional Water Quality Control Board
Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501-3348

**SUBJECT: NUTRIENT TOTAL MAXIMUM DAILY LOADS (TMDL) FOR LAKE
ELSNORE AND CANYON LAKE**

Dear Mr. Thibeault:

The City of Moreno Valley appreciates the opportunity to comment on the proposed nutrient TMDL model for Lake Elsinore and Canyon Lake. We would like to commend Ms. Hope Symthe and Ms. Cindy Li for their dedication, patience, and determination in preparing the TMDL Technical Report and for leading the TMDL workgroup for the past four years.

Below are our general comments on Moreno Valley's current efforts to assist in the solutions to the regional water quality problems. Additionally, we have included our preliminary comments on the revised Technical Report and Attachments dated May 21, 2004 and released on May 25, 2004. Due to the short time frame available to review the report, Moreno Valley requests additional public review time be provided for this very important regional issue.

In general, Moreno Valley budgets more than \$1.2 million a year for its NPDES program. This includes annual catch basin cleaning, bi-weekly street sweeping, commercial, industrial and construction inspection programs, illicit connection and discharge detection and administration including management and maintenance of extended detention basins and constructed wetlands in new developments.

Moreno Valley is very concerned that the water quality benefits (pollution reductions) derived from our current and past management and pollution control practices are not identified in the TMDL model. The model assumes these efforts either do not exist or was calibrated to include them in the background condition. Either way, Moreno Valley

does not receive the benefit of our proactive approaches designed to address these regional problems. Moreno Valley requests the TMDL model be calibrated to acknowledge these efforts and credit the pollutant load reductions as a result of these efforts to Moreno Valley.

Supplemental Water

Moreno Valley agrees and supports the concept that both lakes be stabilized for recreational uses and benefit of the cities of Lake Elsinore and Canyon Lake, including their inhabitants and users as addressed in Finding No. 9 of Order No. R8-2002-0008-A02 (EVMWD Discharge Permit) and Finding No. 7 of Order No. R8-2002-0009-A01 (EMWD Discharge Permit).

Moreno Valley does not agree however, with the TMDL model providing a Waste Load Allocation (WLA) (interim or final) for supplemental water. Moreno Valley believes approval of Order Nos. R8-2002-0008-A02 and R8-2002-0009-A01 usurped the TMDL process although the findings within the orders clearly acknowledged nutrient problems within Lake Elsinore. Notably, comments on the draft orders were not solicited from the majority of the TMDL stakeholders or the TMDL Stakeholder Workgroup which was formed on January 27, 2000, more than two years before adoption of the orders.

If a WLA is provided for discharge of supplemental water to the lakes it reduces the available load for the other stakeholders. In essence, by stabilizing the lakes' water surface elevations with supplemental (reclaimed for Elsinore) water for the benefit of Lake Elsinore and Canyon Lake, their inhabitants and users, without appropriate offsets or credits provided to the other stakeholders, the control costs are passed through to the other stakeholders. These stakeholders then must account for this WLA reduction by implementing additional controls measures at additional costs to their residents and businesses that do not share the economic benefit of the stabilized lakes. Moreno Valley does not believe this is the intent of the Board.

The direct and indirect costs of lake stabilization including any and all costs of removing any pollutants added to the water column via supplemental water should be internalized to the direct users and benefactors of the lakes, the City of Lake Elsinore, Canyon Lake and the water districts and excluded from the TMDL model. Simply put, this is a demand management issue. The users and owners of the lakes require clean water and a stable lake, therefore, they should be required to pay all the costs associated with adding nutrient rich water to the lakes. The WLA for supplemental water as currently modeled should be allocated to the other land uses. Any assignment of a WLA to supplemental water should be done through pollutant trading with the appropriate stakeholders.

Point Source vs. Nonpoint Source Pollution

In consideration of the Federal Clean Water Act (CWA), Moreno Valley is concerned that the Technical Report and Attachments identify Moreno Valley address nonpoint source pollution. Moreno Valley requests that the Technical Report and Attachments include the State/Federal responsibilities for management measures and other controls including adequate funding to address nonpoint source pollution and remove all references to Moreno Valley to support such activities/programs.

40 CFR 130.2(p) defines *Reasonable assurance* for point and nonpoint sources. "Reasonable assurance means a demonstration that TMDLs will be implemented through regulatory or voluntary actions, including management measures or other local controls, by Federal, State, or local governments, authorized Tribes or individuals." Reasonable assurance clearly identifies the responsible parties required to address TMDLs as further discussed below.

40 CFR 130.2(p)(1) addresses point source pollution. This section requires procedures to be implemented to ensure NPDES permits will be issued, reissued or revised as expeditiously as practicable to implement applicable TMDL WLA for point sources. Moreno Valley, as a local government, is permitted as a point source discharger under the 2002 Municipal Separate Storm Sewer System Permit for the Santa Ana River Watershed (point source permit).

Reasonable assurance for TMDLs established for nonpoint source pollution is addressed in 40 CFR 130.2(p)(2). 40 CFR 130.2(p)(2) requires a four-part test for nonpoint source pollution--the fourth part being that the TMDL will be supported by adequate water quality funding. 40 CFR 130.2(p)(2)(i) states in part, "Adequate water quality funding means that the State, Territory, or authorized Tribe has allocated existing water quality funds from any source to the implementation of the TMDL load allocations to the fullest extent practicable and in a manner consistent with the effective operation of **its** clean water program." Local governments are specifically and conspicuously excluded from 40 CFR 130.2(p)(2); therefore any task identified in the Technical Report and Attachments associated with nonpoint source pollution should be managed and funded by the Federal/State coffers as required by the Clean Water Act.

Atmospheric Deposition

Atmospheric deposition occurs throughout the watershed. Atmospheric deposition is a nonpoint source identified in the CWA. Moreno Valley, as well as the other stakeholders, does not have the ability to control atmospheric deposition in the

Letter to Gerald J. Thibeault, Executive Director
June 4, 2004
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watershed just as the lake owners cannot control atmospheric deposition onto the lake surfaces. There is not sufficient justification in the model to exempt atmospheric deposition onto the waterbodies and continue to require the stakeholders in all other areas of the watershed to address atmospheric deposition in their WLA. Moreno Valley requests the total atmospheric deposition be calculated for the entire watershed, removed from the other land uses and include the load as a nonpoint source load allocation in the model.

In summary, Moreno Valley requests the current management and control practices of its NPDES program be calibrated into the TMDL model. Additionally, Moreno Valley requests nonpoint source pollution be addressed by the appropriate parties pursuant to the requirements of 40 CFR 130.2(p). Finally, Moreno Valley believes the science supporting the interim and final TMDL numeric targets in the Technical Report is preliminary and the cost to comply with the proposed numeric targets is so significant that they will be unachievable.

If you have any questions, please do not hesitate to call Kent Wegelin at 909.413.3497.

Sincerely,


Gene Rogers
City Manager

GR/kw

C: Mayor and City Council
Bob Herrick, City Attorney
Trent D. Pulliam, Public Works Director and City Engineer
Thomas F. Breitkreuz, Enterprise Services Manager
Kent Wegelin, Storm Water Program Coordinator



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

HAS

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June 3, 2004

Gerard Thibeault
Executive Officer
Santa Ana Regional Water Quality Control Board
3737 Main St., #500
Riverside, CA 92501

Dear Mr. Thibeault,

We wish to offer our support for adoption of the Lake Elsinore/Canyon Lake nutrients TMDLs and proposed Basin Plan amendment and provide some comments for your consideration. We urge the Regional Board to promptly adopt these TMDLs, consistent with the State's commitment in the State-EPA Performance Partnership Agreement to submit final TMDLs for these waters for EPA approval by 2005.

We have been working with Santa Ana RWQCB for several years on these TMDLs for Lake Elsinore and Canyon Lake. We have reviewed and commented throughout the TMDL development and implementation planning process.

The historical record demonstrates these waterbodies have been impaired since the early 20th century. The primary cause of observed fish kills is due to low dissolved oxygen, which corresponds with high algal productivity due to excessive levels of nutrients. The resultant decay of fish and algae also produce offensive odors, an unsightly lakeshore and thereby adversely affect beneficial uses of these two lakes. We hope the Santa Ana Regional Board will take action to begin to restore the water quality in Lake Elsinore and Canyon Lake and meet all designated beneficial uses. Indeed, the Regional Board has the legal obligation, pursuant to the Clean Water Act and federal regulations (40 CFR 130.7(c)), to establish TMDLs for 303(d) listed waters.

The TMDLs and Basin Plan amendment define interim and final numeric targets which are consistent with the existing applicable water quality objectives for Lake Elsinore and Canyon Lake. Our review of the proposed TMDLs indicates that they meet all federal regulatory requirements and will be approvable upon submittal to EPA.

We understand some stakeholders have suggested the use of concentration-based nutrient TMDL allocations. Federal regulations allow TMDLs to be expressed in terms of mass per time, toxicity, or other appropriate measures; nonetheless, we strongly support the Regional Board's proposal to define the TMDLs and allocations in terms of annual mass loads. This approach is technically appropriate given the long nutrient residence times in lakes and reservoirs and the fact that nutrient loads vary substantially

from year-to-year due to variability in water inputs to each lake. In other words, the desired water quality conditions are unlikely to be achieved using concentration-based allocations alone because they would permit massive nutrient loading into the lake sediments during moderate and wet years, which would then cause eutrophic and impaired conditions in moderate and dry years.

The Regional Board has developed flexible TMDLs using the best available information to date. The Basin Plan amendment outlines short- and long-term plans to address monitoring needs and improved hydrologic modeling. We recommend that pH monitoring of lake water column be included to elucidate ammonia concentrations relative to the water quality objective. The implementation plan also includes compliance schedules that are reasonable and provide adequate time for meeting the interim and final targets.

In closing, we commend the staff for developing a reasonable TMDL plan that is consistent with federal requirements and likely to result in timely attainment of water quality objectives in these water bodies. It is vital for the Regional Board to adopt this amendment without delay and proceed to begin implementing measures to attain water quality standards. If you have any questions concerning these comments, please contact Peter Kozelka, TMDL liaison to Santa Ana RWQCB, at (415) 972-3448.

Sincerely,

A handwritten signature in black ink, appearing to read "David Smith", written in a cursive style.

David Smith,
TMDL Team Leader



Board of Directors

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Richard R. Hall

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Randy A. Record

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Legal Counsel

Redwine and Sherrill

June 28, 2004

Mr. Gerard J. Thibeault, Executive Officer
California Regional Water Quality Control Board
Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501-3339

Subject: Comments on TMDL Report for Lake Elsinore Nutrient Loads

Dear Mr. Thibeault:

Eastern Municipal Water District (EMWD) is a vital stakeholder in the Lake Elsinore watershed and an integral discharger of supplemental water to Lake Elsinore. As a vital stakeholder, we support the scientific process to determine the causes of eutrophication and fish kills in the lakes, but have reservations about the relevance and economic justification in the draft TMDL. Our comments are as follows:

1. We would like to encourage that the pilot program for the discharge of recycled water to Lake Elsinore be extended beyond the current expiration date of December 1, 2004. We believe that the use of recycled water has significantly contributed to the stabilization of lake levels. There has only been a limited study by UCR on the effects of recycled water on the lake and an extension of the pilot study would allow for additional gathering of data to try to better understand the dynamics of the lake.
2. EMWD requests that an economic analysis be performed on the proposed targets, not only for recycled water but for other targets as well. The EPA Region 9, Guidance for Developing TMDLs in California states that the "numeric water quality targets for TMDL must be identified, and an adequate basis for the target(s) as interpretation of water quality standards must be specifically documented in the submittal." The District does not believe that the numeric targets set have an adequate basis and setting this numeric target is premature. As stated in the prior comment, the pilot project for using recycled water as a supplemental source has not been implemented for a sufficient period of time.

The District further believes that these proposed targets are, in essence, water quality objectives. As such, the Porter-Cologne Act requires that economic considerations be taken into account when establishing water quality objectives.

3. The proposed nutrient reduction targets for recycled water from EMWD's treatment plants cannot be achieved on a consistent basis and not without great costs. Extensive modifications to EMWD's treatment plants would have to be implemented to attempt to achieve the interim nutrient targets of 1.0 mg/l for total inorganic nitrogen (TIN) and 0.5 mg/l for phosphorus. The combined discharge quality from our plants is estimated to be 8.0 mg/l for TIN and 2.0 mg/l for phosphorus.

The costs of plant modifications to reach the current proposed targets for recycled water discharges to Lake Elsinore are substantial - approximately \$37 million for our Temecula treatment plant alone. In addition, these costs would be mandated since these targets would be incorporated into EMWD's revised NPDES permit.

4. Rather than having specific nutrient reduction targets mandated for each stakeholder, we would prefer that all the stakeholders and the Regional Board work together so that resources can be directed to the appropriate areas to achieve nutrient reductions for the least amount of costs.

Thank you for the opportunity to participate in the TMDL process. Should you have any questions, please contact Jayne Joy at (909) 928-3777 ext. 6241 or David Morycz at ext. 6325.

Sincerely,



Anthony J. Pack
General Manager

Michael Josselyn, PhD, PWS
543 Sequoia Drive
San Anselmo, CA 94960

July 29, 2004

Hope Smythe, Chief
Inland Waters Planning Section
Santa Ana Regional Water Quality Control Board
3737 Main Street Suite 500
Riverside, CA 92501-3348

RE: Draft TMDL for Nutrients in Lake Elsinore and Canyon Lake

Dear Ms. Smythe:

The purpose of this letter is to provide the Board with my peer review of the Draft TMDL for Nutrients in Lake Elsinore and Canyon Lake. As background information on my qualifications, I am a Professor Emeritus of Biology from San Francisco State University where I taught Biology, Limnology, Estuarine Ecology, and Wetland Ecology for over twenty years. I am currently a private consultant. I have served on a number of scientific advisory panels to state and federal agencies including the EPA, Corps of Engineers, and the National Research Council. I am currently a member of the Technical Advisory Committee for the City of San Francisco Wastewater Treatment Program, the Scientific Advisory Panel for the southern California Wetland Recovery Project, the Science Team for the South San Francisco Bay Restoration Project, and the Scientific Advisory Panel for the Calleguas Creek Watershed TMDL program. I have also conducted previous reviews of TMDL programs for the Upper Newport Bay. Though unrelated to this particular task, I have visited both Canyon Lake and Lake Elsinore and am familiar with the watershed.

In preparation of this review, I have read the following documents:

- Summary of the Proposed Lake Elsinore and Canyon Lake Nutrient TMDL
- TMDL components—Scientific and Technical Issues for Peer Reviewers
- Lake Elsinore and Canyon Lake Nutrient Source Assessment—Final Report
- Internal Loading and Nutrient Cycling in Canyon Lake
- Internal Loading and Nutrient Cycling in Lake Elsinore
- Lake Elsinore and Canyon Lake Nutrient Total Maximum Daily Loads

- Resolution R8-2004-0037

In the document related to Scientific and Technical Issues for Peer Reviewers, a number of questions were asked related to the documents. This letter follows the format of that request.

Numeric Targets

Are the proposed nutrient-related numeric targets for both Canyon Lake and Lake Elsinore appropriate and scientifically defensible?

The proposed targets for the Lake Elsinore and Canyon Lake TMDLs are contained in the draft resolution (Table 5-9n) and on page 17 (Table 4-1) of the Technical Report. Interim and Final concentrations for Phosphorus, Nitrogen, Chlorophyll a, and Dissolved Oxygen are provided. I concur with the finding that phosphorus is the limiting nutrient for both lakes and that controlling this nutrient will have the most substantial influence on algal growth in the water column. A nitrogen TMDL is proposed to reduce potential ammonia toxicity. It may be more appropriate to propose such a TMDL for ammonia rather than for nitrogen.

While lower levels of phosphorus than proposed are generally preferable, I concur with the statements that the lake may be naturally eutrophic given the observations of fish kills previously and the terminal nature of the Lake in this watershed. The targets for phosphorus as proposed reflect both the "natural" eutrophic nature of Lake Elsinore, the reality of the high levels of phosphorus regeneration from the sediments, and the practicalities of trying to "treat" sediments *in-situ*. The shallow nature of the lake leads to wind resuspension [a major source of phosphorus regeneration] that cannot be controlled. However, the reduction proposed (25% percentile) relies on the untested use of aeration to maintain dissolved oxygen levels (see page 61) and the Anderson (2001) study suggests that significant SRP release occurs under oxic conditions. Furthermore, the final standards for phosphorus rely on the use of alum treatments which have been shown not to be as long on average as staff suggest (10-20 years) and effectiveness can vary (Welch and Cooke 1999). Wind resuspension may also affect the ability of the alum layer to effectively cover the bottom. In my opinion, the reduction levels for phosphorus sought for Lake Elsinore rely significantly on proposals that have not been tested for their effectiveness in this particular situation. Chlorophyll levels for Lake Elsinore appear to be appropriately estimated from proposed P concentrations and from other TMDL's in eutrophic lakes. Dissolved oxygen levels are appropriate for aquatic life.

In summary, while the proposed Lake Elsinore TMDL's for phosphorus are desirable, it is not certain that the data or technology exist to reduce the level of internal recycling to reach those levels without major sediment removal.

Given the seasonal stratification that occurs in Canyon Lake, I am in agreement that reduction in loading from external sources would be more effective in controlling phosphorus levels.

Does the technical staff report adequately demonstrate that these targets would be protective of beneficial uses in Canyon Lake and Lake Elsinore?

The technical staff report cites warm freshwater aquatic habitat and water and non-water contact recreation as the beneficial uses impaired by the nutrient levels. I concur that if oxygen levels can be maintained at higher levels (which is also directly related to eutrophic conditions), the levels that are specified could protect those uses. The substantial fish kills that have been observed are evidence of the impairment; however, it is not clear how other compounds or physical factors (high temperature, stratification) capable of having toxic effects on fish are also playing a role in those fish kills. My observations at these two lakes; however, support a conclusion that excessive algal growth is a significant factor affecting both fisheries and human water contact. Therefore, the standards proposed for phosphorus should be most appropriate for controlling algal growth.

Source Analysis

Are the estimates of external and internal nutrient sources scientifically defensible?

The studies by Anderson (2001) and Anderson and Oza (2003) are well documented and employ scientific methods and analyses that are highly defensible. I found those studies very well done. There is less information on the external sources as no flows were monitored during the most recent period when in-lake studies were being undertaken. Therefore, a simulation model was used and the staff appropriately noted that additional data will be needed to calibrate this model in wet years. Given that statement, I concur that the estimates using the LSPC model is the best approach available at this time.

Is the weighted average external nutrient loading approach scientifically defensible? Given data constraints in the technical report, is there an alternative approach that would address the concerns, described above, that motivated the proposed application of the weighted average approach?

High flow events can introduce a significantly different loading to both lakes as shown in Figures 5-18 and 5-20. The weighted average approach is a method to set standards by looking at the frequency of occurrence of each hydrologic event. Loadings would have to be established after a water year is completed, if separate loading criteria would set for each water year. Therefore, from a practical standpoint, averaging is proposed. However, given that external loading is often only a factor during wet years, it may be more desirable to set the loading criteria on the wet year source model results.

Linkage Analysis

Was the model approach employed for both nitrogen and phosphorus appropriate?

Staff relied on a nutrient mass balance model for developing standards. These models are relatively simple and is probably appropriate for Lake Elsinore, a terminal lake. I do not have an opinion about its appropriateness for Canyon Lake.

Is the derivation of the proposed nitrogen and phosphorus TMDL targets clearly explained and is the method employed scientifically defensible?

The proposed targets rely heavily on controls for internal nutrient cycling for Lake Elsinore which may not be achievable for practical and methodological reasons. The staff need to demonstrate that such technologies as suggested could actually work in this system. Otherwise, further reductions in external loadings may be required, though they are relatively insignificant compared to internal sources. In addition, other options for controls on release of water from Canyon Lake in wet years should be explored such as wetland treatment ponds.

External source controls for Canyon Lake are clearly explained and the methods for affecting them are better known and available.

In light of the data constraints identified in the technical report, is the use of the weighted average external nutrient load capacity approach scientifically defensible?

At this time, until additional data can be developed for wet years, I believe this method is the most practical. However, I see that the most significant source of nitrogen and phosphorus to Lake Elsinore during wet years is export from Canyon Lake. Therefore, the source control would be much more difficult given sediment concentrations in Canyon Lake that might be resuspended during a wet year event. The proposed sediment dredging for Canyon Lake might reduce this potential loading source to some unknown degree.

Wasteload Allocations/Load Allocations

Is the method used to derive the WLA's and LAs scientifically defensible?

I believe that the methodology used is a standard approach used in establishing WLA's and LA's in other TMDLs.

Is it appropriate to specify the allocations as 10-year running averages?

Yes, because a 10 year period would capture the various hydrologic events ranging from dry to wet years.

Is it appropriate to specify allocations based on weighted average external load capacity?

Given the potential variation from year to year and the difficulty of regulating on a year-to-year basis, the weighted average method is the most practical approach.

Margin of Safety/Critical Conditions

Is the justification for the implicit margin of safety appropriate and clearly explained in the technical staff report?

The staff made conservative assumptions throughout their analysis and therefore incorporated the margin of safety within these assumptions. As stated above, the role of internal nutrient cycling is significant for both lakes and external loading is a seasonal event. The proposed reduction will require a substantial undertaking in controlling external sources and implementing promising, but not yet locally demonstrated, technologies to remove a very large source of nutrients.

Are the critical conditions identified and appropriately addressed in the staff report?

Yes.

Implementation

Are there additional implementation elements or studies that are necessary or recommended to fill in the data gaps and fine tune the TMDL?


The most important will be calibration of the LSPC model with actual conditions during wet years. The model, while a very useful tool, has not been specifically developed to deal with the climatic situation in the arid west and is not specific to the soil conditions of this watershed. Staff propose to continue to collect data and to adjust the standards as these data become available.

References

Welch, E.B. and G.D. Cooke. 1999. Effectiveness and longevity of phosphorus inactivation with alum. J. Lake and Reserv. Manag. 15:5-27.

I hope that these comments are useful and please call me with any questions. In general, I found that the supporting information developed for the TMDL's was scientifically valid and well done. I am impressed with the work that was completed by Dr. Anderson and believe that this work has generated substantial information appropriate for setting TMDL's. The models that were used in analyzing the watershed and the loading are appropriate to this type of regulatory setting. I believe that the staff have appropriately dealt with the data gaps inherent in such watershed studies. Additional work will need to be done, especially for wet year events.

Sincerely yours,



Michael Josselyn, PhD, PWS
Professor Emeritus